Science WONDER Stories

July

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HUGO GERNSBACK Editor

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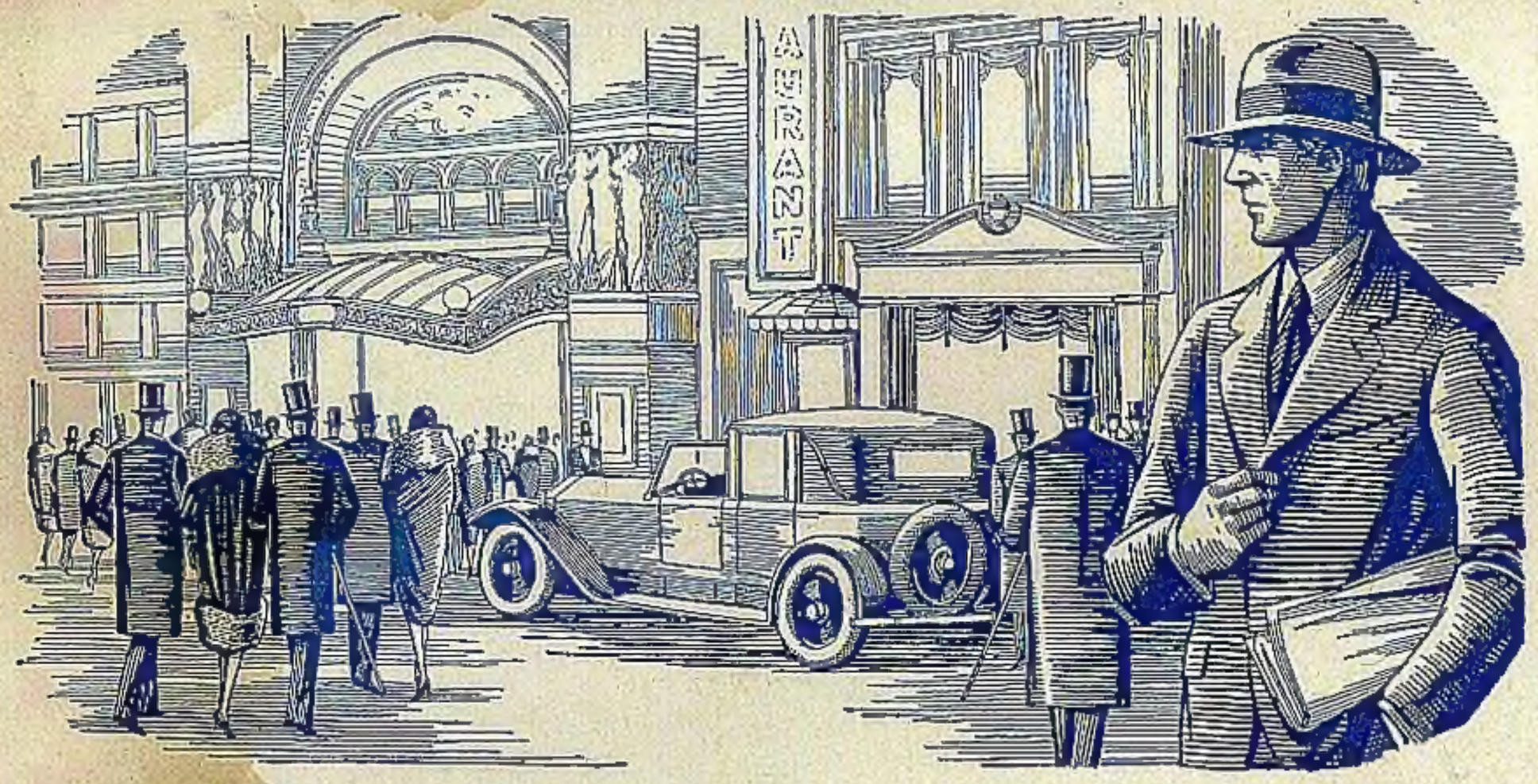
Science Stories by
DR. D. H. KELLER
HARL VINCENT
JACK WILLIAMSON

NEW
SCIENCE NEWS
OF THE MONTH



Always outside of things—that's where I was just twelve short months ago. I just didn't have the cash, that was all. No theatres, no parties, no good restaurants: No real enjoyment of life. I was just getting by, just existing. What a difference today! I drive my own car, have a good bank account, enjoy all the amusements I please.

I Couldn't Get the Good Things of Life

Then I Quit My Job and "Found" Myself

HOW does a man go about making more money? If I asked myself that question once, I asked it a hundred times! I know the answer now—you bet. I know the way good money is made, and I'm making it. Gone forever are the days of cheap shoes, cheap clothes, walking home to save carfare, pinching pennies to make my salary last from one pay-day to the next one. I own one of the finest Radio stores you ever saw, and I get almost all the Radio service and repair work in town. The other Radio dealers send their hard jobs to me, so you can see how I stand in my line.

But—it's just a year ago that I was a poorly-paid clerk. I was struggling along on a starvation salary until by accident my eyes were opened and I saw just what was the matter with me. Here's the story of just how it happened.

One of the big moments of my life had come. I had just popped the fatal question, and Louise said "Yes."

Louise wanted to go in and tell her father about it right away, so we did. He sort of grunted when we told him the news, and asked Louise to leave us alone. And my heart began to sink as I looked at his face.

"So you and Louise have decided to get married," he said to me when we were alone.

"Well, Bill, just listen to me. I've watched you often here at the house with Louise and I think you are a pretty good, upstanding young fellow. I knew your father and mother, and you've always had a good reputation here, too. But let me ask you just one question—how much do you make?"

"Twenty-eight a week," I told him.

He didn't say a word—just wrote it down on a piece of paper.

"Have you any prospects of a better job or a good raise some time soon?" he asked.

"No, sir; I can't honestly say that I have," I admitted. "I'm looking for something better all the time, though."

"Looking, eh? How do you go about it?"

Well, that question stopped me.

How did I? I was willing to take a better job if I saw the chance all right, but I certainly had laid no plans to make such a job for myself. When he saw my confusion he grunted. "I thought so," he said, then he held up some figures he'd been scribbling at.

"I've just been figuring out your family budget, Bill, for a salary of twenty-eight a week. I've figured it several ways, so you can take your pick of the one you like best. Here's Budget No. 1: I figure you can afford a very small unfurnished apartment, make your payments on enough plain, inexpensive furniture to fix such an apartment up, pay your electricity, gas and water bills, buy just about one modest outfit of clothes for both of you once a year, and save three dollars a week for sickness, insurance, and emergencies. But you can't eat. And you'll have to go without amusements until you can get a good substantial raise in salary."

I began to turn red as fire.

"That budget isn't so good after all," he said, glancing at me; "maybe Budget No. 2 will sound better—"

"That's enough, Mr. Sullivan," I said. "Have a heart. I can see things pretty clearly now; things I was kidding myself about before. Let me go home and think this over." And home I went, my mind in a whirl.

At home I turned the problem over and over in my mind. I'd popped the question at Louise on impulse, without thinking it out. Everything Mr. Sullivan had said was gospel truth. I couldn't see anything to do, any way to turn. But I had to have more money.

I began to thumb the pages of a magazine which lay on the table beside me. Suddenly an advertisement seemed almost to leap out at my eyes, an advertisement telling of big opportunities for trained men to succeed in the great new Radio field. With the advertisement was a coupon offering a big free book full of information. I sent the coupon in, and in a few days received a handsome 64-page book, printed in two colors, telling all about the opportunities in the Radio field and how a man can prepare quickly and easily at home to take advantage of these opportunities. I read the book carefully, and when I finished it I made my decision.

What's happened in the twelve months since that day seems almost like a dream to me now. For ten of these twelve months I've had a Radio business of my own! At first, of course, I started it as a little proposition on the side, under the guidance of the National Radio Institute, the institution that gave me my Radio training. It wasn't long before I was getting so much to do in the Radio line that I quit my measly little clerical job and devoted my full time to my Radio business.

Since that time I've gone right on up, always under the watchful guidance of my friends at the National Radio Institute. They would have given me just as much help, too, if I had wanted to follow some other line of Radio besides building my own retail business, such as broadcasting, manufacturing, experimenting, sea operating, or any one of the score of lines they prepare you for. And to think that until that day I sent for their eye-opening book, I'd been wailing "I never had a chance!"

Now I'm making real money, Louise and I have been married six months, and there wasn't any kidding about budgets by Mr. Sullivan when we stepped off, either. I'll bet that today I make more money than the old boy himself.

Here's a real tip. You may not be as bad off as I was. But, think it over—are you satisfied? Are you making enough money, at work that you like? Would you sign a contract to stay where you are for the next ten years, making the same money? If not, you'd better be doing something about it instead of drifting.

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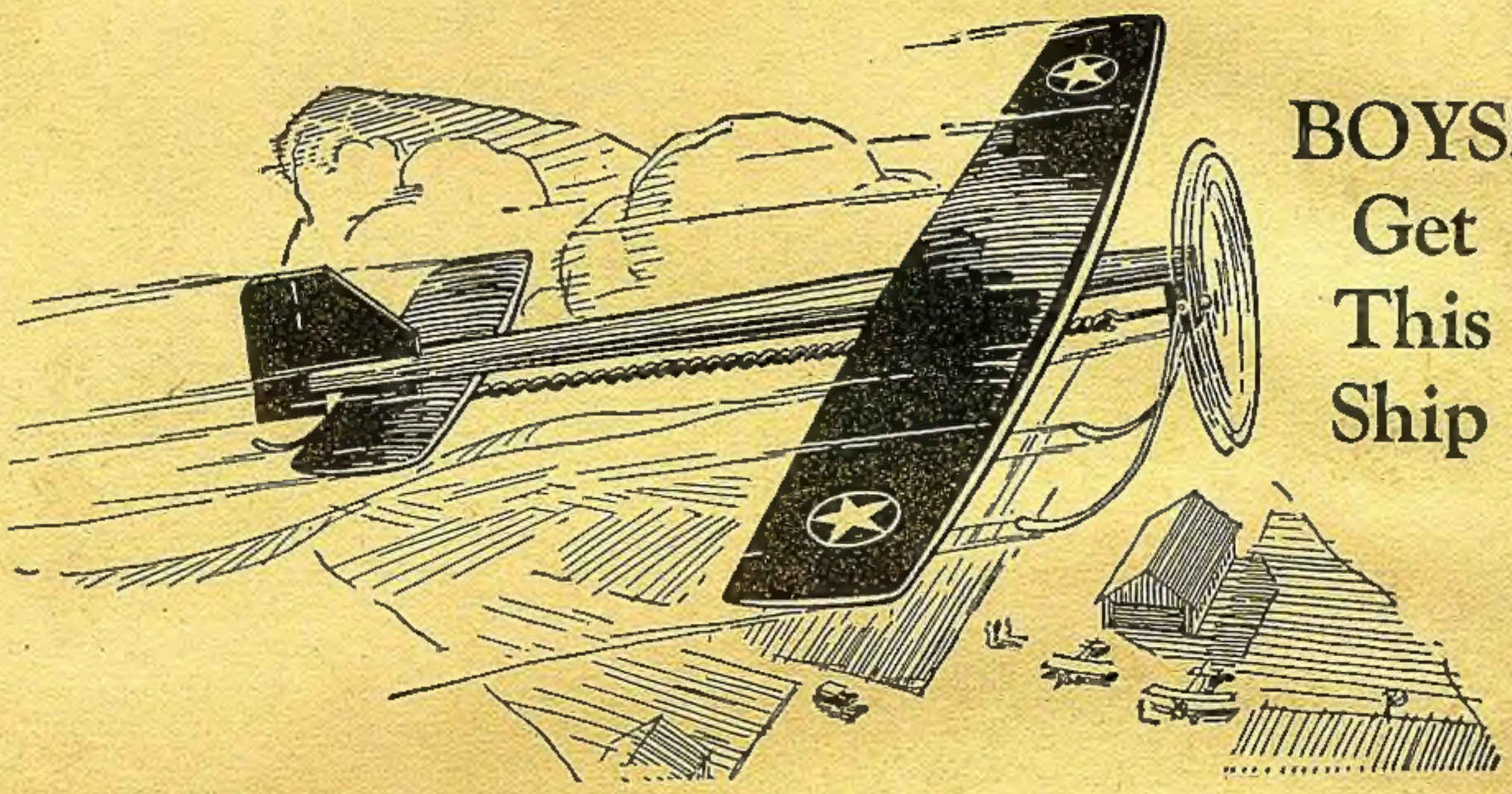

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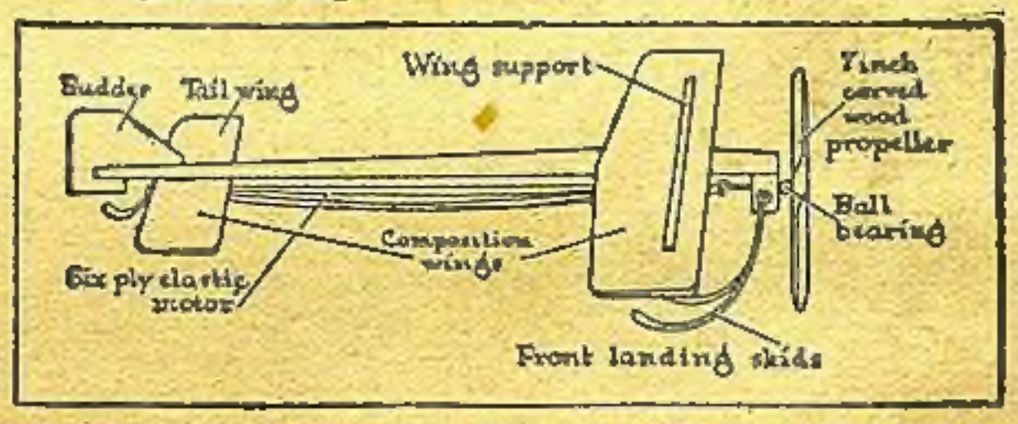

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ON THE COVER

this month is illustrated Mr. Gernsback's editorial "Wonders of Gravitation," which bears directly on the series starting this month, entitled, "The Problems of Space Flying." Mr. Paul, our artist, has shown how, under certain conditions, it is possible for a single man to lift the 60,000 ton steamship *Leviathan* without straining his muscles.

NEXT MONTH

THE ETERNAL MAN, by D. D. Sharp. This is perhaps the greatest short science fiction story of the year. If it had been written by H. G. Wells or Edgar Allen Poe, it would have done both justice. It is one of these little gems that comes along once in a year. You must positively read it.

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THE ALIEN INTELLIGENCE, by Jack Williamson. If you have found the first part of this story interesting and exciting, we have a treat in store for you, because the second part is by far the best. Here is a story that we know will make history in science fiction, and will serve as a standard of comparison for some time to come. It certainly is THE story since the "Moon Pool."

THE MOON BEASTS, by William P. Locke. A marvelous scientific exploration tale that cannot fail to keep your interest, and hold you in suspense until the end. Mr. Locke has advanced some new thoughts on lunar inhabitants, that for sheer daring and imagination are not easily matched in this type of story. Don't fail to read it. This story, unfortunately, was crowded out of the July issue, but will positively appear next month.

AND OTHERS.

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Science WONDER Stories

JULY
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THE WONDERS OF GRAVITATION

By HUGO GERNSBACK

CHAINED as we are to our planet by the force of gravitation, we become so accustomed to it that we hardly ever question the nature of this force that holds us down. The average individual does not stop to think that there is nothing absolute about weight, nor does he realize that it varies tremendously with the various heavenly bodies.

For instance, if you weigh 150 pounds on earth, you would only weigh *two ounces* on the asteroid Eros. On the Moon, you would only weigh 25 pounds, on Mars you would weigh 53 pounds, while on the Sun, which is a much larger body than either of the ones mentioned, you would weigh 4,146 pounds.

The same holds true when it comes to lifting weights. On earth, for instance, a strong man can lift 200 pounds. On the Moon, the same man could lift 1,214 pounds; on Mars 564 pounds, while on Eros, he could lift 262,200 pounds. On the Sun, due to its tremendous mass, the same man could only lift 7 pounds. As a matter of fact, on the Sun, his own weight becomes so great, that he could no longer stand erect, as his own weight could not be supported by his legs any longer and he would have to lie down flat. He would even find it almost impossible to lift up his own arm, which would weigh hundreds of pounds.

In his most interesting articles, beginning in this issue of SCIENCE WONDER STORIES, Captain Noordung has considered all these points carefully, and he has made several highly important and surprising deductions.

The idea of weight loses all meaning in "free space." For instance, if you are in the interior of a space flyer, away from the influence of other heavenly bodies, although you tip the scales at 150 pounds on earth, your weight now becomes zero. In other words, you become "weightless."

But, of course, all other bodies transported out into space, also become weightless. That is, if these bodies are not too large. As soon as they assume larger proportions, such as for instance, the earth or the moon, then again we have the same phenomenon of weight with which we are so well acquainted.

Let us now imagine a hollow steel sphere 20 to 30 feet in diameter, such as are often pictured by our science fiction writers, used as space flyers. Such a small sphere can be considered as a miniature planet and it will attract other lighter objects that are close to it, the same as the earth attracts its objects. For instance, a sheet of paper or a book will tend to gravitate to the wall of the space flyer and stick there. But, the gravitational pull is extremely light and, as Captain Noordung points out, air currents are sufficient to dislodge the objects, just as on earth the wind lifts up against the force of gravity, sheets of paper or leaves which normally are held down to the face of the earth.

One of the largest mobile objects at the present time on earth is undoubtedly the monster trans-Atlantic steamship, *Leviathan*, which weighs 60,000 tons, or 120,000,000 pounds. It is interesting to note that, large as this ship is, it would be quite possible under certain conditions for a single human being to lift it without taxing his strength unduly. Of course, this statement has to be taken with a grain of salt, because in the first place, it would be necessary to transport the *Leviathan* to a point in space where it was possible to perform the experiment, and second, granted that even that were possible, it would be most difficult for a human being to get a good grip on the ship itself. Perhaps he might hold the ship up by the end of the mast, using the top of the mast as a handle.

It is also interesting to note the various requirements necessary to perform the experiment. Suppose some great space flyer had transported the *Leviathan* safe and sound out into space. It would, now, be necessary for us to land it on some stellar body which in itself must be quite small, because if it is too large, the attraction of this body to the *Leviathan* would become so great that we would not find it possible to have a single man lift it.

If we were to take the ship on one of the small asteroids, such as Eros, which has a diameter of 10 miles, we would find that according to earth standards, the *Leviathan* would still weigh 100,000 pounds. By calculation, we find that the body on which we are to land the ship must be a sphere not larger than 1/45 of a mile, that is 116 feet in diameter and that the density of its material must not be more than .60 that of our own earth, such as is the density of the various asteroids, Eros or Ceres.

Suppose we have located such a 116-foot asteroid somewhere out in space. Also supposing that our space flyer has deposited the *Leviathan* safe and sound on the surface of our tiny planet. Of course, we see immediately that the length of the *Leviathan* is almost eight times as long as the diameter of our little planet. If we now wish to lift up the steamship as shown on our cover painting, some other things will be necessary.

One is, that we first must have our feet anchored to the planet. If we did not take this precaution, the *Leviathan* with its huge mass, would itself act as a planet to attract us and we would float towards the center of gravity of the steamship. By anchoring our feet with stirrups to the tiny planet, we will then find it possible to lift or push away the *Leviathan* which now weighs only 200 pounds. And if the planet were still smaller, it would be possible, scientifically for a man to lift it with one hand, as shown on the cover.

Of course, there is a mutual attraction between the tiny planet and the steamship, but in lifting the *Leviathan* over our head, we successfully keep the little planet and the ship from colliding and the lifting feat is thus accomplished.

All very surprising, but nevertheless true in the light of celestial mechanics.

The Alien Intelligence

By Jack Williamson

I fired on the instant and had the luck to shatter the vessel, splashing the liquid over his person. His purple robe was eaten away; his flesh was dyed a deep purple and partially consumed.

CHAPTER I

The Mountain of the Moon

BEFORE me, not half a mile away, rose the nearest ramparts of the Mountain of the Moon. It was after noon, and the red sun blazed down on the bare, undulating sandy waste with fearful intensity. The air was still and intolerably hot. Heat waves danced ceaselessly over the uneven sand. I felt the utter loneliness, the wild mystery, and the overwhelming power of the desert. The black cliffs rose cold and solid in the east—a barrier of dark menace. Pillars of black basalt, of dark hornblende, and of black obsidian rose in a precipitous wall of sharp and jagged peaks that curved back to meet the horizon. Needle-like spires rose a thousand feet, and nowhere was the escarpment less than half that high. It was with mingled awe and incipient fear that I first looked upon the Mountain of the Moon.

It was a year since I had left medical college in America to begin practise in Perth, Australia. There I had an uncle who was my sole surviving relative. My companion on the voyage had been Dr. Horace Austen, the well-known radiologist, archeologist, and explorer. He had been my dearest friend. That he was thirty years my senior, had never interfered with our comradeship. It was he who had paid most of my expenses in school. He had left me at Perth, and went on to investigate some curious ruined columns that a traveler had reported in the western part of the Great Victoria Desert. There Austen had simply vanished. He had left Kanowna, and the desert had swallowed him up. But it was his way, when working on a problem, to go into utter seclusion for months at a time.

My uncle was an ardent radio enthusiast, and it was over one of his experimental short wave sets that we picked up the remarkable message from my lost friend that led me to abandon my practise, and, heeding the call of adventure that has always been strong in those of my blood, to seek the half mythical Mountain of the Moon, in the heart of the unexplored region of the Great Victoria Desert of Western Australia.

The message was tantalizingly brief and hard to interpret. We picked it up five times, over a period of two weeks, always just after sunset. Evidently it was sent by one who had not recently practised his knowledge of code, and it seemed that the sender was always in a great hurry, or under a considerable nervous tension, for minor errors and omissions were frequent. The words were invariably the same. I copy them from an old notebook.

JACK WILLIAMSON

"To Winfield Fowler, physician, Perth, Australia: I, Horace Austen, am lost in an unknown new world, where alien terrors reign, that lies in a crater in the Mountain of the Moon. I implore you to come to my aid, for the sake of mankind. Bring arms, and my equipment — the Röntgen tubes and coils, and the spectrometer. Ascend ladder at west pinnacle. Find my friend Melvar, maiden of the crystal city, whom I left beyond the Silver Lake. Come, for the sake of civilization, and may whoever hears this forward it with all dispatch."

My uncle was inclined to suspect a hoax. But after the message had come over twice I received telegrams from several other radio amateurs who had heard it, and were forwarding it to me. We took the direction of the third call and had amateurs in Adelaide do the same. The lines intersected in the Great Victoria Desert, at a point very near that at which Wellington located the Mountain of the Moon, when he sighted it and named it in 1887.

Knowing Austen, as I did, to be intensely human as a man, but grave and serious as a scientist, it was impossible for me to take the message as a practical joke, as my uncle, deriding the possibility of my friend's being imprisoned in "an unknown new world," insisted it was. It was equally impossible for one of my impetuous and adventurous disposition to devote himself to any prosaic business when so attractive a mystery was beckoning him away. Then I would never, in any case, have hesitated to go to Austen's aid, if I knew him to be in need.

I got together the apparatus he had mentioned — it was some equipment he happened to have left with me as he went on—as well as my emergency medicine kit, a heavy rifle, two .45 Colt automatics, and a good supply of ammunition; and waited for more explicit signals. But the calls had never come regularly, and after the

NOT since the famous "Moon Pool" by A. Merritt, have we read such a remarkable story as the present one, by the well-known author.

We are quite certain that this story will be one of the outstanding science fiction achievements of the year. It will be discussed and re-discussed time and again. In a way it is a little classic and stands in a place by itself.

The author has a knack, not only to arouse your curiosity, but to keep it at a high pitch throughout the entire story, but best of all, his science while fantastic is always within the realms of possibility and there is no reason why the astounding things which he paints so vividly, could not be true, either now or in the future.

Do not, by any means, fail to read this outstanding story.

fifth no more were heard. Having waited another irksome week, I bade my uncle farewell and got on the train. I left the railway at Kanowna, and bought three ponies. I rode one and packed provisions, equipment, and water bottles on the other two. Nothing need be said of the perils of the journey. Three weeks later I came in sight of the mountain.

Wellington had christened it as he did because of an apparent similarity to the strange cliff-rimmed craters of the moon, and the appellation was an apt one. The crags rose almost perpendicularly from the sand to the jagged rim. To climb them was clearly out of the question. The rock was polished slick by wind-blown sands for many feet, but rough and sharp above. To my left, at the extreme west point of the great curve, was a dark needle spire that towered three hundred feet above its fellows. I knew that it must be Austen's "west pinnacle." What sort of ladder I was to ascend, I had little idea.

As the sun sank back of the rolling sea of sand, dark purple shadows rose about the barrier, and I was struck with deep forebodings of the evil mystery that lay beyond it. The gold of the desert changed to silver gray, and the gray faded swiftly, while the deep purple mantle swept up the peaks, displacing even the deep red crowns that lay like splashes of blood upon the summits. Still I felt, or fancied, a strange spirit of terror that lurked behind the mountain, even in the night.

Quickly I made camp. Just two of the ponies were left, and they were near death (I have passed over the hardships of my trip). I hobbled them on a little patch of grass and brush that grew where water had run from the cliff; pitched my little tent, and found brush to start a tiny fire. I ate supper, with but a scanty cup of water; then, oppressed by the vast mysterious peaks that loomed portentously in the east, shutting out the starlight, I went in the tent and sought my blanket. Then came the first of those terrible and inexplicable occurrences that led up to the great adventure.

CHAPTER II

The Abyss of the Terror-light

FIRST I heard a faint whispering sound, or rather a hiss, infinitely far away, and up, I thought, over the cliffs. Then the cloth of the tent was lighted by a faint red glow thrown on it from above. I shivered and the strange spell of the mountain and the desert fell heavier upon me. I wanted to go out and investigate; but unfamiliar terror held me powerless. I gripped my automatic and waited tensely. The scarlet radiance shone ever brighter through the cloth. The sound turned to a hissing, shrieking scream. It was deafening, and it plunged straight down. It seemed to pause, to hover overhead. The red glare was almost blinding. Abruptly the tent was blown down by a sudden tempest of wind. For perhaps a minute the terror hung about me. I lay there in a strange paralysis of fear, while a hurricane of wind tore at the canvas upon me. I heard upon the tempest, above that awful whistling, a wild mad laugh that rang against the cliff, weirdly appalling. It was utterly inhuman, not even the laugh of a madman. Just once it rang out, and afterwards I imagined it had been my fancy.

Then the light and the sound swept up and away. With belated courage I tore my way from under the cloth. The stars were like jewels in the westward sky, where the zodiacal light was still visible. The ominous blackness of the mountain blotted out the eastern stars; and the peaks were lighted by a vague and flickering radiance of scarlet, like the reflection of unpleasant fires beyond. Strange pulsing, exploring fingers of red seemed to thrust themselves up from behind the cliff. Somehow they gave me the feeling that an incredibly great, incredibly evil personality lurked beyond. The crimson light shone weirdly on the wild summits of the mountain, as if they were smeared with blood.

I threw more brush on the fire, and crouched over it, feeling uncomfortably alone and terrified. When the flames had flared up I looked about for the ponies, seeking companionship even in them. They were gone! At first I thought they had broken their hobbles and run off, but I could neither see nor hear them, and they had been in no condition to run far. I walked about a little, to look for them, and then went back to the fire. I sat there and watched the eerie, unwholesome glare that shone over the mountain. No longer did I doubt the existence of Austen's "world where alien terrors reign." I knew, even as I had felt when I first saw the mountain, that strange life and power lurked beyond it.

The Ladder Found

PRESENTLY I stretched the tent again, and lay down, but I did not sleep.

At dawn I got up and went to look for the ponies. I climbed one of the low dunes and gazed over the gray infinity of sand, but not a sign of them rewarded my look. I tried to trail them. I found where they had been hobbled, and followed the tracks of each to a place where the hoofs had cut deep in the sandy turf. Beyond there was no trace. Then I was certain of what I had already known, that the Thing had carried them away.

Then I found something stranger still—the prints of bare human feet, half erased by the wind that had blown while the terror had hung there. That unearthly laugh, and the footprints! Was there a land of madmen behind the mountain? And what was the thing that had come and gone in the night? Those were questions I could not answer, but daylight dulled my wondering fear.

The sun would not rise on my side of the mountain until nearly noon, and the cold dark shadow of the cliff was upon me when the desert all about was a shimmering white in the heat of the sun. Austen's call had mentioned a ladder. I set out to find it. Just north of the peak I came upon it, running straight up like a silver ribbon to the top of

the cliff. It was not the clumsy affair of ropes that I expected, In fact, I at once abandoned any idea that Austen had made it at all. It was of an odd-looking white metal, and it seemed very old, although it was corroded but little. The rungs were short white bars, riveted to long straps which were fastened on the rock by spikes of the same silvery metal. I have said that the mountain rises straight from the sand. And the ladder goes on into the ground. That suggests that the sand has piled in on the base of the mountain since the ladder was put there. At any rate, I am sure that it is incredibly old.

I went back to camp; packed together my guns, a little food, and Austen's equipment; and started up the ladder. Although it was no more than six hundred feet to the top, heavily laden as I was, I got very tired before I reached it. I stopped several times to rest. Once, looking down on the illimitable sea of rolling sand, with the tiny tent and the sharp shadow of the mountain the only definite features, I had a terrible attack of vertigo, and my fears of the night returned, until I almost wished I had never started up the ladder. But I knew that if I were suddenly back in Perth again I would be more eager than ever to set out upon the adventure.

At last I reached the top and crawled up in the mouth of a narrow canyon, with the black stone walls rising straight to the peaks on either side. Down the crevice was a smooth curving pathway, very much worn, it seemed, more by time than human feet. It was not yet noon. I waited a few minutes to rest; then walked up the path with a very keen curiosity as to where it led. It grew so deep that the sky overhead was but a dark blue ribbon in which I saw Venus gleaming whitely. It widened. I walked out on a broad stone platform. And below me lay—the abyss.

I stood on the brink of a great chasm whose bottom must have been miles, even, below sea level. The farther walls of the circular pit—they must have been forty miles away—were still black in the shadow of the morning. Clouds of red and purple mist hung in the infinities of space the chasm contained, and completely hid the farther half of the floor. Beneath me, so far away that it was as if I looked on another world, was a deep red shelf, a scarlet plain weird as the deserts of Mars. To what it owed its color I could not tell. In the midst of the red, rose a mountain whose summit was a strange crown of scintillating fire. It looked as though it were capped, not with snow, but with an immense heap of precious jewels, set on fire with the glory of the sun, and blazing with a splendrous shifting flame of prismatic light. And the crimson upland sloped down—to "the Silver Lake." It was a lake shaped like a crescent moon, the horns reaching to the mountains on the north and the south. In the hollow of the crescent beyond, low hills rose, impenetrable banks of purple mist lying back of them to the dark wall in the distance. The lake gleamed like quicksilver and light waves ran upon it, reflecting the sunlight in cold blue fire. It seemed that faint purple vapors were floating up from the surface. Set like a picture in the dark red landscape, with the black cliffs about, the argent lake was very white, and very bright.

CHAPTER III

Down the Silver Ladder

FOR a long, long time I gazed into the abyss, lost in the wonder and the mystery of it. Meanwhile the sun climbed over and lit the farther rim, which still was black or dully red, because of the dark colors of the volcanic rocks of which it is composed. The scene was so vast, so strange, so wildly beautiful and unearthly, that it seemed almost a dream, instead of an ominous reality. It was hard to realize that somewhere upon the red plain, or along the shores of the Silver Lake, or perhaps beneath the banks of mist beyond, Austen was—or had been—alone, and in distress. I wondered, too, from what part of this strange world had come the thing of the whistling sound and the red light, which had taken the ponies.

It was well after noon before I ate a little lunch and took thought of the matter of descent. I saw that a second ladder led down in a fine line of silver until it disappeared above the crimson upland, miles below. I climbed over the brink and started down. Descending was easier than climbing had been, but I had infinitely farther to go. The soles of my shoes were cut through, and my hands became red and blistered on the rungs. Sometimes, when I was too tired to go on, I slung myself to the ladder with a piece of rope from my pack, while I rested.

Steadily the black walls rose higher about me. The red plateau beneath, the mountain with its crown of flaming gems, and the strange white lake beyond, came nearer and nearer.

I was still half a mile above the scarlet plain when the shadow of the western wall was flung fast over the valley floor, and the light purple mists beyond the argent lake deepened their hue to a dark and ominous purple-red.

But the Silver Lake did not darken. It seemed luminous. It gleamed with a bright, metallic silvery luster, even when the shadow had fallen upon it. Whenever I rested, I searched keenly the whole visible floor of the abyss, but nowhere was any life or motion to be seen.

With a growing apprehension, I realized that I would not have time to reach the ground before dark. I had no desire to be sticking like a fly to the face of the cliff when the Thing that had made the red light was moving about. Disregarding my fatigue and pain, I clambered down as fast as I could force my wearied limbs to move. The process of motion had become almost automatic. Hands and feet moved regularly, rhythmically, without orders from the brain. But sometimes they fumbled or slipped. Then I had to grasp, frenzied, at the rungs to save my life.

Night fell like a black curtain rolled quickly over the top of the pit, but the half-moon of the

Silver Lake still shone with its white metallic light. And strange, moving shapes of red appeared in the mist in the hollow of the crescent. The light that fell upon the rock was faint, but still enough to help, and still I hurried—forcing hands and feet to follow down and find the rungs. And fearfully I looked over my shoulder at the bank of mist.

Suddenly a long pale finger of red—a delicate rosy ray—shot high out of it. And up the vague pathway it sped, a long slender pencil of crimson light—a narrow, sharp-tipped scarlet shape—high into the night, and over and around in a long arching curve. Down it plunged, and back into the mist. Presently I heard its sound—that strange whistling sigh that rolled majestically and rose and fell, vast as the roar of an erupting volcano. Other things sprang out of the purple bank, slender searching needles of brilliant scarlet, sweeping over the valley and high into the starlit sky above.

Following paths that were smooth and arched, with incredible speed, they swept about like a swarm of strange insects, always with amazing ease, and always shooting back into the cloud, leaving faint purple tracks behind them. And the great rushing sounds rose and fell. Those lights were incredible entities, intelligent—and evil.

They flew, more often than anywhere else, over the crown of lights upon the hill—the gems still shone with a faint beautiful glow of mingled colors. Whenever one swept near the mountain, a pale blue ray shot toward it from the cap of jewels. And the red things fled from the ray. More and more the flying things of crimson were drawn to the mountain top, wheeling swiftly and ceaselessly, ever evading the feeble beams of blue. Their persistence was inhuman—and terrible. They were like insects wheeling about a light.

All the while I climbed down as fast as I could, driving my worn-out limbs beyond the limit of endurance, while I prayed that the things might not observe me. Then one passed within a half mile, with a deep awful whistling roar, flinging ahead its dusky red pathway, and hurtling along with a velocity that is inconceivable. I saw that it was a great red body, a cylinder with tapering ends, with a bright green light shining on the forward part. It did not pause, but swept on along its comet-like path, and down behind the Silver Lake. Behind it was left a vague purple phosphorescent track, like the path of a meteor, that lasted several minutes.

After it was gone, I hurried on for a few minutes, breathing easier. Then another went by, so close that a hot wind laden with the purple mist of its track blew against my face.

I was gripped with deathly, unutterable terror. I let myself down in the haste of desperation. Then the third one came. As it approached it paused in its path, and drifted slowly and deliberately toward me. The very cliff trembled with the roaring blast of its sound. The green light in the forward end stared at me like a terrible, evil eye.

Exactly how it happened I never knew. I suppose my foot slipped, or my bleeding hands failed to grasp a rung. I have a vague recollection of the nightmare sensation of falling headlong, of the air whistling briefly about my ears, of the dark earth looming up below. I think I fell on my back, and that my head struck a rock.

In the Red Scrub

THE next I knew it was day, and the sun was shining in my eyes. I struggled awkwardly and painfully to my feet. My whole body was bruised and sore, and the back of my head was caked with dried blood. My exhausted muscles had stiffened during the night, and to stand upon my cut and blistered feet was torturing. But I had something to be thankful for—that I had been within a few feet of the ground when I fell; and that the red thing had departed and left me lying there, perhaps thinking me dead.

I leaned against the base of the metal ladder and looked about, I had fallen into a thicket of low red bushes. All about grew low thick brush, covering the slightly rolling plain. The plants were scarcely knee-high, bearing narrow, feathered leaves of red. The delicate, fern-like sprays of crimson rippled in the breeze like waves on a sea of blood. The leaves had a peculiar bright and greasy appearance and a strange pungent odor. The shrubs bore innumerable tiny snow-white flowers that gleamed like stars against the deep red background.

I think that the red vegetation had evolved from a species of *cycad*. Undoubtedly the greater crater had been isolated from the outer world when the great tree-ferns were reigning throughout the earth. And, as I was presently to find, the order of evolution in the deep warm pit had been vastly different from that which had produced man as its highest form of life. Presently I was to meet far stranger and more amazing things than the red bush. I am inclined to believe that the extraordinary color may have been due to the quality of the atmosphere, perhaps to the high pressure, or to the purple vapors that ever rose from the region beyond the Silver Lake.

Nowhere did I see any living thing, nor did I hear any sound of life. In fact one of the strange things of the place was the complete absence of the lower forms of life, and even of the smaller insects. The silence hung oppressively. It grew intolerably monotonous—maddening.

Far away to the right and to the left the walls of the pit rose straight and black to the azure infinity that arched the top. To the left of me, five or six miles away, towered the gem-crowned hill, its summit a blaze of ever-changing polychromatic flame. Beyond it, all along the east, the red plateau fell away to the Silver Lake, which lay like a curved scimitar of polished steel, with the faint bank of purple mist shrouding the low red hills that rose inside the curve beyond. The sun was just above the eastern peaks, shining purple through the mist.

After a time I limped slowly down the nearest of

the little valleys. As I went my roving eye caught the bright glitter of brass on the ground at my feet. Searching in the red shrubs, I picked up three fired cartridges for a .45 calibre automatic. I held them in my hand and gazed over the weird scene before me, lost in wonder. They were concrete proof that Austn had passed this way, had here fought off some danger. He must yet be somewhere in this strange crater. But where was I to find *"Melvar, maiden of the crystal city,"* and what was she to do for me?

Presently I went on. I wanted water to bathe my cuts and bruises. I was very thirsty as well as hungry. My pack was an irksome burden, but I did not discard it, and I carried the heavy rifle ready in my hand. I was still feeling very weak. After a painful half mile I came to a tiny pool in a thicket of the red scrub. I lay down and drank the cool clear water until I was half sick. I threw away the remnants of my shoes and bathed my feet.

A Curious Sight

SUDDENLY my attention was arrested by a crystal clashing sound. There was a marching rhythm in it, and the clatter of weapons. I crouched down the shrubbery and peered fearfully about. I saw a line of men, queerly equipped soldiers, marching in single file over the nearest knoll. They seemed to be wearing a closely fitting chain mail of silvery metal, and they had helmets, breastplates and shields that threw off the sunlight in scintillant flashes of red, as if made of rubies. And their long swords flashed like diamonds. Their crystal armor tinkled as they came, in time to their marching feet.

One, whom I took to be the leader, boomed out an order in a hearty, mellow voice. They passed straight by, within fifty yards of me. I saw that they were tall men, of magnificent physique, white-skinned, with blond hair and blue eyes. On they went, in the direction of the fire-topped mountain, until they passed out of sight in a slight declivity, and the music died away.

It is needless to say that I was excited as by nothing that I had seen before. A race of fair-haired men in an Australian valley. What a sensational discovery! I supposed that they had built the metal ladder and come down it into the valley, but from whence had they come? Or was the Mountain of the Moon itself the cradle of humanity, the Garden of Eden?

Then the crystal weapons of the soldiery suggested that they used some transparent crystalline substance in lieu of metal, and that the iridescent crown upon the mountain might be the city of the race. Was it Austen's "crystal city?" That would suggest a high civilization, but I saw no sign of the mechanical devices that are the outstanding features of our own civilized achievement. Certainly the soldiers had carried no modern weapons.

Then I thought of the footprints and the eerie laugh. I wondered what contact Austen had had with these people. Had they been friends or foes? I wondered if it had been the men of the crystal city who had paid me a visit outside the cliffs. If so, the red torpedo-shapes of the night must be aircraft, and they must have advanced the art of aerial navigation to a very high degree.

I determined, first of all, to do some spying, and find out as much as possible about the strange race before I revealed my presence. I was not in a very good trim for battle, and I had taken much pains for concealment when the men passed. But I had little doubt that my guns were so far superior to their crystal swords that I could fight them at any odds if they proved unfriendly.

So presently I bound my feet with bandages from my medicine kit, attended as best I could to the wound on the back of my head, and walked slowly on the direction of the mountain, keeping in the cover of the valleys as much as possible. Although I could limp painfully along, the red vegetation offered me no very serious impediment to my progress. The low bushes crushed easily underfoot, burdening the air with their unfamiliar, pungent odor. The country was rolling, the low hills and level valleys all covered crimson with the scrub, gigantic boulders scattered here and there. The Silver Lake shimmered in the distance—a bright, white, metallic sheet.

The gem-capped mountain rose before me until I saw that the gaunt black sides rose a full thousand feet to the crown of blazing crystal. And as I drew nearer, I saw that indeed the gems were buildings, of a massive, fantastic architecture. A city of crystal! Prismatic fires of emerald-green, and ruby-red, and sapphire-blue, poured out in a mingled flood of iridescence from its slender spires and great towers, its central ruby dome and the circling battlements of a hundred flashing hues.

CHAPTER IV

Melvar of Astran

JUST before noon I staggered into a little dell that was covered with unusually profuse growths of the crimson plants. Along a little trickling stream of water they were waist high, bearing abundantly the star-shaped flowers, and small golden-brown fruits. Suddenly there was a rustling in the thicket and the head and shoulders of a young woman rose abruptly out of the red brush. In her hand she held a woven basket, half full of the fruits. In my alarm I had thrown up the rifle. But soon lowered it and grinned in confusion when I realized that it was a girl, and by far the most beautiful one I had ever seen. I have always been awkward in the presence of a beautiful woman, and for a few minutes I did nothing but stand and stare at her, while her quizzical dark, blue eyes inscrutably returned my look.

She was clad in a slight garment, green in color, that seemed to be woven of a fine-spun metal. Her hair was long and golden, fastened behind her shapely head with a circlet—a thin band cut evidently from a single monster ruby. Her features were fine and delicate, and she had a surpassing grace of figure. That her slender arms were stained to the elbows with the red juice of the plants—she had been picking the golden fruits—did not de-

tract from her beauty. I was struck—and I will admit it, conquered—by her face. For a little time she stood very erect, looking at me with an odd expression, and then she spoke, enunciating the words very carefully, in a rich golden voice.

The language was English!

She said, "Are you—an American?"

"At your service completely," I told her, "Winfield Fowler, of White Deer, Texas, and New York City, not to mention other points. But I own to some surprise at finding a knowledge of the idiom in a denizen of so remote a locality."

"I can understand," she smiled. "But I think you could talk—more simply. So you are Winfield, who came with Austen across the great—ocean from America?"

"You guessed it," I said, trying to keep my growing excitement in hand, while I marveled at her beauty. "Is mind reading common in these parts?"

"Doctor Austen—the American—told me about you, his friend. And he gave me two books. Tennyson's poems, and—'The Pathfinder.'"

"So you have seen Austen?" I cried in real astonishment. "Are you Melvar? Are you the 'maiden of the crystal city?'"

"I am Melvar," she told me. "And Austen stopped in Astran one *sutar*—that is thirty-six days."

"Where is he now?" I eagerly demanded.

"He was a strange man," the golden voice replied. "He did not fear the Krimlu, as do the men of Astran. He walked off toward the pass in the north that leads around—around the Silver Lake, he called it. He had been watching the Krimlu as they came at night, and doing strange things with some stuff he took from—the Silver Lake. While he was here, the hunters brought in one of the—" again she hesitated, at a loss for a word. "—The Purple Ones," she concluded. "He took that to examine it."

"What are the Krimlu?" I exclaimed. "What—or who—are the Purple Ones? What is the Silver Lake?"

"You are a man of many questions," she laughed. For a moment she hesitated, with her blue eyes resting on my face.

"The Krimlu, so say the old men of Astran, are the spirits of the dead who come back from the land beyond the Silver Lake to watch the living, and to carry off the evil for their food. So the priests taught us, and so I believed until Austen came and told me of the world that is beyond. He told the Elders of the outer world, but they put upon him the curse of the sun, and drove him away. And indeed it is well that he was ready to go so willingly beyond the Silver Lake, for Jorak would have offered him to the Purple Sun had he been in the city another night."

Suddenly she must have become conscious of the intensity of my unthinking gaze, for she abruptly dropped her eyes, and flushed a little.

"Go on," I urged her. "What about the Purple Ones and the Silver Lake? Your account is certainly entertaining, if somewhat more mystifying than illuminating. At this rate you will have me a raving maniac in an hour, but the process is not unpleasant. Proceed."

Fowler Grows Bold

SHE looked up at me, smiled, looked off to the side, then let her eyes return to mine with curious speculation in them. "What is the Silver Lake," she went on, "you know as well as I, though Austen tried to find its secret. The touch of its water is death—a death that is terrible. And the Purple Ones—you will see them soon enough! They are strange beings who come, no one knows whence, into the land of Astran. The priests tell us that they are 'The Avengers of the Purple Sun.'—but did you come down the ladder as Austen did?"

"Most of the way in the same manner," I told her. "I finished the descent rather faster than he did, I imagine."

"Is there really," she asked, "a broad world beyond, with fields and forests that are green, and seas that are of clear blue water, and a sun that is not purple, but white? Such Austen told me, but the elders say that the ladder is the path to the Purple Sun, and beyond is nothing. Is it true that there is a great nation of the men of your race, a nation of men who know the art of fire that Austen showed us, and greater arts, who can travel in ships over water and through the air like the Krimlu?"

"Yes," I said, "the world is that, and more, but, in all of it, I have never seen a girl so beautiful as you."

It is not my habit to make such speeches to ladies, but I was feeling a bit light-headed on that morning, as a reaction from my terrible adventure, and I was rather intoxicated by her charm.

She smiled, evidently not displeased, and looked away again, apparently composing her expression with difficulty. There was a suspicious twinkle in her dark blue eyes.

"Tell me why you have come into this land," she asked abruptly.

"Austen sent for me to come to his aid." I replied.

"You and Austen are not like the men of Astran," she mused. "Not one of them ever went out to face the Krimlu or even the Purple Ones, of his own free will. You must be brave."

"Rather, ignorant," I said. "Since I have seen the 'Krimlu,' as you call the flying lights, I am about ready to give up my courage of any kind."

Then, because my exhausted condition had robbed me of my ordinary sense of responsibility, I did such a thing as I had never dared before. The girl was standing close before me, matchlessly beautiful, infinitely desirable. Her eyes were bright, and the sunlight glistened in her golden hair. And—well, I admit that I did not try very hard to resist the temptation to kiss her. I felt her arm at my back, a sudden quick thrust of her lithe body. The next I knew I was lying on my back, and she was bending over me, with tears in her eyes.

"Oh," she cried. "I didn't know. Your head! It is bleeding. And your hands and feet! I didn't notice!"

So I was compelled to lie there while the beautiful stranger very tenderly dressed and bandaged the cut on my head. In truth, I doubt that I would have been able to get up immediately. The touch of her cool fingers was very light and deft. Once her golden hair brushed against my cheek. Her nearness was very pleasant. I knew that I loved her completely, though I had never taken much stock in love at first sight.

Presently she had finished. Then she said, "When Austen gave me the books he left a letter for any man of the outside who might happen to come to Astran. You must come with me to the city, to get it, and to rest until you can walk without limping so painfully. Then, if you will, you can go on around the northern pass. Perhaps you can find Austen. But the Krimlu are mighty. No man of Astran has ever dared oppose them. No man who has ever gone into that accursed region has ever been seen again."

CHAPTER V

Astran, the Crystal City

THE sun dropped beneath the rim, and the purple dusk began to thicken and to creep over the valley floor. I took up my precious equipment, and Melvar and I walked off through the red brush in the direction of the mountain. The vast strange buildings of the city of gems were still glowing with soft color, and the cold, bright surface of the Silver Lake flashed often into sight beyond the rolling eminences. Presently we came to a well-worn path through the crimson scrub, but I saw nothing to indicate that anyone had thought of paving or improving it. But the Astranians did not seem to have much energy for any kind of public work. Their material civilization appeared to be on a rather low scale. In fact they supplied their wants in the way of food entirely with the abundant fruit of the red bushes. As I had guessed from the girl's remarks, they did not even have the use of fire. Indeed the great physical and mental development of the race and the splendid city in which it lived was strangely contrasted with their absolute lack of scientific knowledge.

Our pace was hastened by thoughts of the terrors that night would bring, and perhaps because of them, we walked nearer one another, and presently we were hurrying along, hand in hand. About us the purple night deepened and, beyond the argent brilliance of the Silver Sea, the strange evil of the night gathered itself for the attack.

At last we came to the narrow path that wound up the side of the mountain to the splendid palaces that crowned it. We hurried; came to a great arched gate in the emerald wall, and entered. The huge, incredibly magnificent buildings were scattered irregularly about the summit, with broad spaces between them. Here and there were paved courts of the silvery metal, which must have been an aluminum bronze, but the open ground was for the most part grown up in rank thickets of the red brush. The great building showed the wear and breakage of ages. Here and there were great heaps of gleaming crystal, where wonderful edifices had fallen, with the brush grown up around them. Incredible as it may seem, I think the old civilization of Astran had possessed a science that was able to synthetize diamonds and other precious stones, in quantities sufficient even for use as building stone. Later I had an opportunity to examine bits of the fallen masonry.

Towering above all, on the very peak of the mountain, was a great ruby dome, vast as the dome of St. Peter's, and mounted upon the center of the top was a huge machine that resembled nothing so much as a great naval gun, though it was made of crystal and white metal. A little group of men were gathered about it, and as I watched they swung the great tube about, and a narrow ray of pale blue light poured out of it. And down on the plain below, where the practise beam had struck, a great boulder flashed into sudden incandescence. In their exploration of the ultraviolet spectrum, our own scientists have found rays that are strangely destructive to life, and considerable progress has been made in the development of a destructive beam of wireless energy. But later I was to meet a far more terrible ray weapon than that slender blue beam.

"With that," said Melvar, "our people fight off the Krimlu at night. But the Krimlu are so many that sometimes they are able to land and take our people. If only we had more of the beams! But there is no man in all Astran who knows how the light is made, or anything save that the blue light shines out to destroy when rock of a certain kind is put into the tube. Austen wished to examine it, and spoke of something he called 'radium ore' but the priests forbade. Indeed, his curiosity is one of the reasons Jorak had for driving him away."

Standing about the ill-kept streets were a few of the people of the crystal city. All were of magnificent physique, and intelligent looking, white-skinned, and fair haired. All wore garments that seemed of spun metal, and gleaming crystal weapons. Most of them were hurrying along, intent on affairs of their own, but a few gathered around us almost as soon as we stepped in the gate. I felt that they were hostile to me. They questioned Melvar in a tongue that was strange to my ears; then became engaged in a noisy debate among themselves. Their glances toward me were furtive and sullen, and their eyes had the look of men crazed by fear.

Safe!

MELVAR was saying something in a conciliatory tone, and I was swinging my rifle into position for use, when there was a sudden shout from the gate of the city, and the clashing of cry-

stal weapons. The interruption was most welcome to me. The crowd turned eagerly to the new arrivals. I saw that they were a band of soldiers, possibly the same that had passed me in the morning. Slung to a pole carried between the foremost two, was a strange thing. Weirdly colored and fearfully mutilated as it was, I saw that it was the naked body of a human being. The head was cut half off, and dangling at a grotesque angle. The hair was very long and very white, flying in loose disorder. The features were withered and wrinkled, indeed the whole form was incredibly emaciated. It was the corpse of a woman. The flesh was deep purple!

As I stood staring at the thing in horror, there was laughter and cheering in the crowd, and a little child ran up to stab at the thing with a miniature diamond sword. Melvar touched my arm.

"Come," she whispered. "Quickly. The people do not like your coming. They did not like the things Austen told of the world outside, for the priests teach that there is no such world. It is well that the hunters came when they did with the Purple One. And let us hope that the priests of the Purple Sun do not hear of you."

As she spoke she led me rapidly away through a tangle of the red brush, and through a colonnade of polished sapphire. Then she quickly led the way down a deserted alley, across another patch of the red shrubbery, and down a short flight of steps into a chamber that was dark.

"Wait here," she commanded. "I must leave you. I think that Jorak has had spies upon me, and if I were too long absent he might grow suspicious. He was the enemy of my father, and some day my brother will slay him. But sometimes I am afraid of the way he looks at me. However there is no danger now. If the priests hear, I will somehow get you out of Astran. I think they will not seek you here, whatever may happen. My brother will bring the message from Austen, and food and drink. May you rest well, and have faith in me!"

She ran up the steps, and left me standing in the darkness, in a state of uncomfortable indecision. I did not like the turn that affairs had taken. It is never pleasant to be alone in the dark in a strange and dangerous place. I would have much preferred to take my chances out on the open plain, with nothing but the moving lights to fear, terrible as they were, than here in this strange city, full of ill-disposed savages. A diamond knife will kill a man just as effectively and completely as the weirdest death that ever roamed the night.

For a time I stood waiting tensely, with my rifle in my hand, but I was very tired and weak. Presently I got out my flashlight and examined the place. It was a little cell, apparently hewn in the living rock of the mountain. There was nothing in the way of furniture except a sort of padded shelf, or bed, at the back. I sat down upon it, and presently went to sleep there, though I had no intention of doing so.

Austen's Letter

THE next I knew, someone was shaking my arm, and shouting strange words in my ear. I opened my eyes. Standing before me was a young man. In one hand he held a crystal globe filled with a glowing, phosphorescent stuff, faintly lighting the little apartment. I sat up slowly, for my limbs were stiff. The gun was still in my hand. Without saying anything more, the young fellow pointed to a tray that he had set by me on the shelf. It contained a crystal pitcher of aromatic liquid, and a dash of the yellow fruit. I gulped down some of the drink, and ate a few of the fruits, feeling refreshed almost immediately. Then the boy—he was not more than sixteen years of age—thrust into my hand an envelope addressed in the familiar handwriting of Austen. He handed me the light and walked up the stone stairs.

With feeling that well may be imagined, I tore open the envelope and read, in the faint light of the glowing bulb, the words of my old friend.

"Astran, in the Mountain of the Moon,
June 16, 1927.

"To whomsoever of my own race this may be delivered:

"Since you must so far have traveled the mysterious dangers of this strange world, it is needless for me to dwell upon them. I write this brief missive for the information of anyone who shall happen to find the way in here in the future, and in order that the riddle of my own disappearance may some time be cleared up, if I fail to return. For I intend to explore the region beyond this lake—I call it the Silver Lake—or to lose my life in the attempt.

"My name is Horace Austen. I came to the Great Victoria Desert to investigate the sculptured columns reported by Hamilton, far to the west of here. I found the ruins and incredibly ancient they are. They must date from fifty thousand years ago, at the latest. Among them was an amazing pictographical record of a race of men driven by the drying up of their country to emigrate to the crater of a great mountain nearby. There was no mistaking the meaning. I was, of course, intensely interested, for nothing of the kind had ever been reported in Australia, and certainly the people depicted were not Bushmen.

"It happened that I remembered Wellington's account of the Mountain of the Moon, whose northern cliff was followed for a few miles by his route of 1887. That appeared to be the best chance for the great crater described on the columns. It was but natural for me to decide to investigate it. There is no use for me to dwell upon my hardships, but the last of my water was drunk when I found the ladder, which was located just as the inscriptions indicated.

"I reached the red plain without accident, and found the fruit of the strange vegetation a palatable and nourishing food. So far I have escaped the red

lights that haunt the night, and it is their mystery that I am determined to solve. I went down to the metallic lake, and investigated it. I confess myself quite unable to account either for the nature or for the incredible origin of the fluid. With proper precaution it can be studied without great difficulty, but since I am almost entirely without apparatus, I have learned little enough about it.

"I had been in the crater a week when I decided to approach the city of jewels on the mountain. I have been in Astran over a month, but on account of the savagery and ignorance of the people, and the oppressive rule of the priesthood, I have not been on very friendly relations with them—with the exception of the girl, Melvar, who seems far above the others of her race, and who has been my friend from the first. I have been able to learn but little from them, although I have acquired a fair knowledge of the language. My instructor in it, the beautiful Melvar, is showing a keen desire to learn English, of which she is gaining a command with remarkable speed, and is developing, as well, an insatiable curiosity about the outer world.

"The sentiment against me has been ever running higher, and tomorrow I shall leave the crystal city, and endeavor to round the sea in the north and to reach the mist-veiled land beyond. My only regret in leaving is that I shall see Melvar no more. I wish there were some way to secure her the advantages of a civilized education.

"These may be my last words to the world, if, indeed, they ever come into the hands of a civilized man. And I know that sooner or later the crater will be discovered and entered. My chief purpose in writing this, aside from the satisfaction of leaving an account of my own doings is to state my firm belief, I may say, my certain knowledge, that the strange things that may be observed here, supernatural or incredible as they may appear, result from perfectly natural forces in the control of a civilized power that may not be much above our own advancements.

Horace Austen"

CHAPTER VI

Fowler Recovers

I READ it in the faint glow of the phosphorescent globe, and read it again. So Austen was beyond the crescent, if he had been able to carry out his plan. The date of the letter was ten months back. Then the radio message had probably come from the other side. And why had it been sent? Austen was not one to appeal for aid for himself alone. Had he feared some general danger to the human race? I thought of his phrase, "for the sake of mankind," and shuddered at a picture of the red lights sweeping like destroying angels over a great city like New York decimating the terrorized population.

I tried to think what was best for me to do, if ever I got out of Astran alive. I supposed that Austen had been able to round the Silver Lake in the north. I should be able to follow him. Clearly there was nothing for me to do but to find out as much about this strange world as possible, and to get the equipment to him as soon as I could do so.

I stayed in the cellar-like home for a week. Twice each day the young chap came to bring food and drink. He knew but a few words of English, and during the hour or so he stayed each time I had him to try teaching me the language of Astran. But my progress was slow, and I never learned more than a few score words. The language seemed much more complex, even, than English, with bewildering rules of inflection. But I developed quite a liking for the boy. He had a simple, straight forward manner, and a good sense of humor. His name was Naro. He was the brother of Melvar, and two years younger. Their father, it seemed, had been carried off several years before, when the flying lights made a great raid, and the mother had soon after fallen a victim to the sacrificial rites of the hated Jorak. And the boy himself bore the scars of wounds he had suffered a few months before in a terrific battle with one of the Purple Ones, as those monsters were called, which so mystified me then, and with which I had such terrible experiences later.

On the second day Melvar came. She brought a great flask of aromatic oil that she poured over my wounds. It must have been remarkably healing, for in a few days I found myself entirely recovered. Before she left she told me that the priests had heard of my arrival, and that it was whispered among the people that I was a supernatural being, sent as an omen of an attack by the Krimlu. She told me, too, that there was talk that a sacrifice would soon be offered at the altar of the Purple Sun, to appease the angry Spirits of the dead. Sweet and innocent child, she seemed to have no fear that she, who had brought me into the city, would be the sacrifice, and I did nothing to let her know my misgivings, although I did propose that we leave the city together as soon as possible. How I hated to see her leave the apartment!

The Shrine of the Purple Sun

DURING the following days I questioned Naro constantly as to the doings of his sister, and of the Astranians, but I was able to elicit no very satisfactory information, except that none of the Krimlu had been seen for several days, and that the headmen of the nation were beginning to expect a raid in force. Also I persuaded him to keep a very close watch on the movements of Melvar, and to come to me at once if Jorak made any attempt to get her into his power, or if the sacrificial ceremony was begun with the victim unselected.

During the interminable periods when I was alone, I was driven almost insane by the monotony and the anxiety of my existence. But I had my scientific equipment, and I had the boy to bring me a few assorted fragments of the crystal building stone, which I tested and found to be real gems, of several varieties. Many of the gems were simple

enough in chemical formula, and composed of the most common elements, so the synthesis of them by scientific means is not unreasonable.

For example, it is a well-known fact that diamond is just a crystal form of carbon, which element occurs in three allotropic forms. Those three forms are diamond, graphite, which also crystallizes, and amorphous carbon, of which charcoal is a form. Since carbon occurs in the air in carbon dioxide, it is not impossible that latterday science would be able to manufacture diamonds from the air. Sapphires are aluminum oxide, or alumina, colored with a little cobalt, and rubies are composed of the same oxide, with a trace of chromium, to which the color is due. A clay-bed would supply an inexhaustible amount of the elements needed for the synthesis of these gems, and I think the people of old Astran had been able to accomplish it. I examined the little glow-lamp, too, and found it to be simply a crystal bottle filled with the moist crushed leaves of the red plants, which formed a culture of some kind of luminous bacteria.

On the seventh night, when the pale ray of daylight that filtered down into my hiding place was dimned, Naro burst into the chamber, panting, and wild-eyed with terror. His crystal sword was gone, his metallic mantle was torn, and blood was falling, drop by drop, from a deep scratch on his arm. He thrust into my hand a tattered scrap of paper, evidently the flyleaf of a book. On it, in an ink that I took at first to be blood, although it was probably the juice of the red plants, the following words were formed in hastily drawn printing characters.

"Winfield, There is no hope. The priests will offer a gift to the Purple Sun. I am the victim. Already I am in the hands of Jorak. I am sorry, for I loved you. It may be that I can give this to Naro, who could take it to you. The Krimlu are coming tonight. Already their lights flicker above the mist. In the morning my brother will take you to the gate, and you may escape. If only it had been one night later we might have all been away together. Farewell.

Melvar."

No time was to be lost. I had been anticipating something of the kind. The guns were cleaned and loaded. My pack was soon ready. Naro took a part of my equipment. I followed the boy up the stair, with the phrase, "For I loved you," ringing in my heart.

We reached the top and walked out into the red brush. Beneath the purple starlight the vast fantastic columned halls of Astran were gleaming faintly, and I caught a brief blue flicker from the great machine on the ruby dome.

Suddenly, with a sharp thrill of terror that made me catch my breath, I heard the awful distant whining sigh that grew until it rolled and reverberated through the heavens, and the air seemed alive with its deep intensity. Above the emerald wall I glimpsed the green-tipped needle of crimson that made the sound. It was sweeping through the sky meteor-swift, while the pale blue beam stabbed out at it ineffectually. It passed in an instant, but others came, and soon the sky was lighted with the weird red radiance, and the very mountain top vibrated with the whistling roars. The things swept around and around in a mad confusion of darting flames. They were like moths about a candle.

We passed an amber palace wall and came suddenly upon a great, metal-floored court. Marching across it were a half score of the Astranian men-at-arms, their accoutrements gleaming weirdly in the light of the strange things above. They saw us at once, and charged upon us with a shout. I dropped to my knees. Once my rifle spoke, and I rejoiced at its heavy thrust against my shoulder, and the acrid odor of the smoke. I felt a man again. And the leader of the soldiers fell upon his face.

Melvar Saved

NARO gripped my shoulder and pointed upward. One of the red things was plunging down, like a great red Zeppelin with a great green light at its forward end, its purple phosphorescent track swirling up behind it. The soldiers forgot us and scattered in mad terror. Naro jerked my arm and in a moment we had tumbled into a copse of the red brush. For a moment the bloody radiance was thrown upon us in an intense flood, and the screaming roar was deafening. A few minutes more, and the thing had flashed up and away. A breath of hot purple mist passed over us. When we got to our feet and crept out of the thicket the soldiers were gone.

Swiftly, Naro led me on, keeping in the shadows of the building, on in the cover of the thickets. Once a man sprang suddenly at us from behind a sapphire pillar, diamond sword drawn.. My pistol exploded in his face and blew his head half off. Naro possessed himself of the dead man's weapons, and we went breathlessly on. Three times, in other parts of the city, we saw the red shapes drop to the ground for a few minutes, and then dart up again, while ever the blue ray played back and forth upon them.

At last we passed between vast ruby columns and stood beneath the huge red dome. Before us lay a great space, fairly lit with a rosy light from the crystal walls. Around the farther side were seated tier upon tier, thousands of the brilliantly clad people of Astran. In the center of the great floor, resting upon a pedestal, was a globe of shining purple—a sphere of coruscating flame—itself immense, perhaps forty feet in diameter, but insignificent in that colossal hall. Standing at rigid attention, in regular rows about the pedestal were a few score bright-armed soldiers, and as many other erect men in long purple robes. All eyes were fixed on a point in front of the gigantic globe, and hence hidden from where we stood.

We hurried silently across the smooth metal floor,

our footsteps drowned in the rushing sounds of the flying things above. We ran around the great purple sun-sphere of crystal, and came abruptly upon a dramatically terrible scene. Beneath the sphere was an altar of glowing red, with the priests and soldiery all grouped about it. By the altar, kneeling and silent, clad in a filmy green robe, was the beautiful form of Melvar. Just behind her stood a tall hawk-like man, in his hands a great transparent crystal vessel full of a liquid that gleamed like molten silver.

As we came around the sphere he was holding up the vessel and repeating a strange chant in a monotonous monotone. At sight of us he dropped into alarmed silence, with an ugly scowl of hate and fear distorting his harsh features. For a moment he stood as if paralyzed, then he rushed toward the silent girl as though to empty the contents of the crystal pitcher upon her.

I fired on the instant, and had the luck to shatter the vessel, splashing the shining silvery fluid all over his person. The effect of it was instantaneous and terrible. His purple robe was eaten away and set on fire by the stuff; his flesh was dyed a deep purple, and partially consumed. He tottered and fell to the floor in a writhing, flaming heap.

In the confusion, and the dazed silence that fell upon the vast assemblage at sight of that horrible thing, Melvar, aroused from her resignation of despair by the report of the pistol, sprang to her feet in incredulous surprise. For a moment she looked wonderingly at us. Then she turned and shouted a few strange and impressive words at the priests. Her white arms swept up in a curious gesture.

Then she turned and sped toward us. We started running back the way we had come. The dramatic fall of Jorak, and the evident terror that Melvar's courageous and timely words, whatever they had been, had inspired, served to hold the Astranians motionless until we had traversed the better part of the distance to the columns. But then they started after us en masse. I dropped to my knees at the columns and began firing steadily with the rifle. They fell, sometimes two or three at a shot, but still they charged on, and their number was overwhelming.

Then, outside, there was a sudden louder shrieking roar. A flood of red light poured through the columns, and there was a terrific crash upon the dome. Dense clouds of hot purple vapor poured into the vast room. One of the flying lights had landed upon the roof. The charging throng behind us stopped and ran about in confusion. We darted out through the purple clouds and ran for the shadow of the nearest building. We kept close by the mighty walls until we reached the gate. Daring the terrors of the night, we ran out and down the narrow trail. By dawn we were several miles from Astran in the direction of the shining lake.

CHAPTER VII

The Silver Lake

AT the coming of day we were walking over a gently rolling scarlet plain, scattered with gigantic solitary boulders, that sloped gradually down to the Silver Lake. The lake lay flat and argent white, clad in all the ominous mystery of that strange world, calling, beckoning us on, challenging us to learn the secret of the fartherest bank of purple fog, with a grim warning of the doom that might await us. The red fern-like sprays waved gently in the breeze, and the vivid, tiny white flowers seemed to sparkle with a million glancing rays, like frost in the sunshine; but the deep intensity of the red color lent a weird and unpleasant suggestion of blood. Beyond the Silver Lake, low hills rose, faint and mysterious in the purple haze.

Melvar walked beside me when the way was smooth enough; she was talking vivaciously. She had a keen sense of humor and a lively wit. She seemed to have an almost childishly perfect faith in my power and that of my guns—but I was far from feeling confident.

At sunrise we stopped by a little pool of clear water, drank, and made a meal of the abundant yellow fruit. Astran, with the scintillating fires kindled again in its jeweled towers by the rising sun, lay far behind and above us. When we had finished eating, Melvar stood looking for a long moment at its glorious sparkling light. She murmured a few words beneath her breath, in the Astranian tongue, and turned again toward the Silver Lake.

In two hours we came to the shore of the great lake. The red scrub grew up to the brink of a bluff a dozen feet high. Below was a broad, bare sandy beach, with the gleaming waves, quicksilver white, rolling on it two hundred yards away. For a few minutes we stood at the edge of the cliff, in the fringe of crimson brush, and let our eyes wander over the vast flat desert of flowing argent fire. We peered at the misty red hills beyond, trying to penetrate their mysteries, and to read what lay behind them. Then we scrambled down on the hard white sand. Naro grasped his weapon and looked up and down the beach.

"It is along the shore of the Silver Lake," Melvar said, "that the Purple Ones are most frequently found."

"The Purple Ones, again!" I cried. "What are they—decorated rattlesnakes?" Then, with a sickening sensation of terror, I remembered the horrible, half-human purple corpse that I had seen the soldiers bringing into Astran. "Are the Purple Ones men?"

"In form, they are men and women" Melvar said, "but they dwell alone in the thickets like beasts. All of them are old and hideous. They are savage, and they have the strength each of many men: Our soldiers must always hunt them, and fight them to the death. A single man, even though armed, could

do nothing against one of them, for they are terribly strong, and they fight like demons. Their country is not known, and no children of their kind are ever found. The priests say that they are of a race of dwarfs that dwell beneath the Silver Lake."

Here was another of the baffling mysteries of this strange world. In fact, I was coming upon unpleasant mysteries much faster than I could comfortably stomach them. Lone, purple, savage animals, in the form of emaciated humans, who prowled about the country like wolves, and like wolves were hunted down by the Astranians! Again I shuddered at the memory of the limp purple corpse the soldiers had carried, and with a strange chill of the heart, I remembered the human footprints that had been left where my ponies were taken in the desert, and of the eerie, insane laughter that I had heard, or thought I heard, above the whistling roar.

My thoughts ended with the construction of a mad hypothesis of a race of purple folk who lived beyond the Silver Lake, who were accustomed to make slave raids on the whites in torpedo-shaped airships, and who made a practise of releasing, or turning out, the superannuated ones of their kind to prey on the people of the crystal city. It seemed, in fact, quite plausible at the time, but I was far from the hideous truth. I could see no reason, if one race could attain a civilization high enough to synthetize diamonds for building stone, why another might not be able to build ships as marvelous as the red torpedoes. But my reason rebelled at the acceptance of the ideas of demonic and supernatural horrors my emotional self tried to force upon it.

The Touch of the Metal

PRESENTLY I roused myself and led the way down the white waves. My companions held back nervously and warned me not to touch it, or I would die as Jorak had done. But I succeeded in filling a test tube with the stuff. It was not transparent. It was white, gleaming, metallic, like mercury, or molten silver. I carried it back up to the bluff and set about examining it, while Naro stood guard, and Melvar watched me. She asked innumerable questions, concerning not only the operation in hand, but on such subjects as the appearance of a cat, and Fifth Avenue styles of ladies' garments. Upon which (the latter subject), however, I was lamentably ignorant. And so often did I pause, to answer her questions, to laugh at the naive quaintness of her phrases, or to let my eyes rest on her charming face, that the attempted analysis of the metal did not progress with any remarkable celerity.

The silver liquid was very mobile and very light, having a specific gravity of only .25, or not even four times that of liquid hydrogen, which is .07. It was extremely corrosive. Tiny bits of wood or paper were entirely consumed on contact with it, with the liberation, apparently, of carbon dioxide and water vapor, and a dense purple gas that I could not identify. That suggested, of course, that the stuff contained oxygen, but as to how much, or in what combination, I had no idea. A drop of it on a larger piece of paper set it afire. I found, too, when testing the electrolytic qualities of the liquid, that when I introduced into it a copper and a silver coin, electrically connected, that the stuff was rapidly decomposed into the purple vapor, with the generation of a powerful current. But the metal seemed not affected at all. That was another puzzling result. My experiments, of course, were comparatively crude, and when I had gone as far as I could, I really knew little more about the silver liquid than in the beginning.

Despite Melvar's warning, and my own precautions, I splashed a drop of it on my arm. She cried out in horror, and I saw that a splotch of purple was spreading like a thin film over the skin. There was no pain, but the muscles of the arm were seized with sudden and uncontrollable convulsions. Melvar tried to wash the stain off with water from my canteen. In an hour the color had faded, though the limb was still sore and painful.

By that time, the purple disc of the sun was sinking low, and we took thought of how to spend the night. Naro climbed up on the plain to gather a few of the fruits for our supper, and we found a little cave in the bluff that seemed a good place of shelter. I gathered an armful of the red brush and made a fire.

The leaves burned fiercely, crackling as if they contained oil. The fire produced a great volume of acrid black smoke. Combustion was greatly accelerated on account of the increased atmospheric pressure here, many thousand feet below sea level. Melvar and Naro were intensely interested in the performance, although they had seen Austen light a fire while he was in the city.

Melvar slept in the cavern, and Naro and I took turns at standing guard at the entrance. The darting pencils of crimson were abroad again, but they passed far overhead, and we heard the sounds of their passage only as vast and distant sighs. In the morning we rose early, and clambered back up the cliffs. I was in rather a puzzling situation. Clearly my duty was to get Austen's equipment to him as quickly as possible, but I liked neither to desert Melvar and her brother, nor to let them accompany me into the unknown perils of the region beyond. But the latter course seemed the best, and they were ready enough to go with me anywhere.

The Land of Madness

HAVING retraced our course of the day before for perhaps a mile, in order to get upon the upland, we set out for the north. The sun was just rising above the black rim when Naro shouted and pointed at the mist-clad red hills beyond the Silver Lake. At first I looked in vain; then I caught a faint flicker of amber light, pulsing up through the purple air.

Abruptly a vast mellow golden beam of light sprang from behind the distant scarlet hills and

spread up toward the zenith in a deep yellow flood. It seemed to vibrate, to throb with incredibly rapid fluctuations. Suddenly, bright swift-changing formless shapes of green and red flared up within it, shot up the beam, and vanished. The radiance dimmed and died. I could see nothing, but somehow I felt that an invisible beam of vibrant force was still pouring up into the sky. Here was another manifestation of the unknown power beyond the sea. The beam had come. So far as visibility was concerned, it was gone. What had been its meaning, its purpose?

Beyond the Silver Lake, low cliffs rose above a broad sandy beach, faintly veiled by the purple mist. The red hills were fainter still above them, and the thicker pall of purple haze that hung over the hidden place beyond, stood out distinctly against the distant, steep black wall that threw his jagged crags to the sky so far above. Out of that vale of mystery the ray had leapt—and died. Or had it merely faded, and was now, invisible . . .pulsing still?

All seemed as it had been before, but from the attitude of my companions I knew there was more to come. They were gazing up into the sun-bright void above and waiting expectantly.

Then I saw, far, far above, growing gradually brighter against the sky, as if it were being projected there by a great magic lantern behind the hills, an upright bar of silver haze. Slowly it grew brighter and its outlines sharper until it looked like a vertical bar of silver metal in the sky—inconceivably huge. The length of the bar must have been miles, its diameter, many hundreds of yards. It hung still in the heavens, neither rising nor falling. Here was the display, indeed, of alien science and power!

Presently I recovered from my first wonder, and became conscious that the blue eyes of Melvar were upon me quite as much as on the astonishing thing in the sky. "Melvar, have you seen it before?" I asked. "Is it real—natural? Is it made by man?" I found to my surprise that my voice was odd and quavery. I had not realized the intensity of my nervous strain. I waited eagerly for the reassurance that she could not give.

"It comes often," she replied. "Every day for many months of the year. The priests say that it is the evil goddess of the under-earth, who loves the Purple Sun and flies to the sky to meet him. But the Sun goes on unheeding, and the goddess cries silver tears until her Lord is gone from the sky. But there is yet more to see."

I looked up again and saw that a faint colored mist was gathering about the bar. It grew brighter, condensed, seemed drawn into swirling rings by a sort of magnetic attraction. And the iridescent mist-rings swam about the bar, moved ever faster until they were whirling madly. Their coruscating shapes grew brighter, plainer, until they were vivid, spinning flames of color in the sunshine. I noticed that the red was about the center of the silver bar, and that the bands of color above and below ran regularly to the other end of the spectrum, with rings of violet at the bottom and at the top. During all this time I heard no sound. It was as still as death.

Still the color-rings spun and changed, growing ever brighter and sharper edged. The red band grew larger about the center, until its diameter was the length of the cylinder. It gleamed with a lurid scarlet light. Below and above were spinning, burning circles of orange, yellow, green, and blue, each thinner than the one next nearer the center, and of smaller diameter. And the violet rings had shrunk to great globes of violet fire, shining with painful intensity.

Indeed, as Melvar had said, there had been more to see. The thing was so utterly strange, so utterly inexplicable, that I was grasped in a paralysis of unfamiliar terror, my breath choked off and my heart beating wild with fear, staring straight at it. It was so definitely directed by intelligence that I felt it must spring from a weird and awful mind. Indeed, it seemed that I felt the power of a vast and alien will stealing over me, seizing command of me, making me the slave of itself. I struggled against it. I clenched my hands and knotted my muscles with the intensity of my resistance to the spell. Wheeling sparks of red fire swam before my eyes.

Then my efforts weakened. I could hold out no longer. The alien will had won. Reason and feeling and love flowed away and left me as cold and cruel as a rock in a stormy, wintry coast— a savage, inhuman animal. Care had left me. My soul had lost her throne. I laughed. A wild, unearthly sound it was, like that I had heard as I lay beneath the tent beyond the barrier.

I whirled around fiercely, but a firm arresting hand was laid on my shoulder. From afar off, deep blue eyes looked into mine—eyes that were cool and sane and brave. They shone through the red curtains of insanity in my brain. They broke the spell of fear.

Suddenly I was very weak, and trembling and sick. Melvar's lithe arms were close about me. Her throbbing heart was close to mine. And in her dark, warm blue eyes, so close to mine, were sympathy, and tenderness, and love. She was human; she was real. I knew that her love would shield me from these terrors. I smiled at her, and sank down weakly in the red brush. But she had saved my mind. I had wandered on the brink of the fearful insanity of terror, and she had brought me back.

I looked from her sweet face, so full of anxious concern to the thing in the sky. But now it seemed remote, unreal, and I gazed at it with weak indifference. Presently I saw that the whole thing was beginning to sink as though a weight were being accumulated upon it. Suddenly an immense gleaming globule of silver fell from the lower violet globe and dropped straight for the Silver Lake, while the weird form of lights that had made it floated back to its former elevation. The great shining sphere fell and struck the white lake with a deafening

roar, sending out great concentric waves in all directions. The amazing thing sank again, released a second huge drop, and rose. The process was repeated again and again, the interval being, by my watch, about 3 minutes, 15.2 seconds. All day it went on, with the great waves washing up the bluffs above the beach, and before night the level of the Silver Lake stood perceptibly higher.

Here was the mystery of the origin of the Silver Lake explained, but by a phenomenon far more inexplicable than the sea itself. In vain I tried to account for it in some rational way, or to assign some natural cause for the thing. My mind could hardly grasp it. It was almost unbelievable, even as I looked upon it. My reason would not admit that such a thing could be in a rational world.

CHAPTER VIII

Stalked by the Purple Beast

So weak was I after that terrible experience that it was noon before I felt able to go on. The thing, as I have said, continued to hang in the sky all day, and to drop regularly its burden of the silver liquid. But presently I became accustomed to it, and realized that it threatened us with no immediate danger.

After a light lunch of the yellow fruit, and a deep draught of water from a little stream that seemed almost parallel to our route of march for a mile or two, we retired to the higher ground where the scrub was not so dense as in the bottom of the valley, and set out for the north again. Still I was feeling mentally limp—dully indifferent to what was passing about—and physically exhausted as well. I was not as much on my guard against the weird perils of the place as I should have been.

Several times Naro stopped and listened, declaring that something was following us, keeping in the cover of waist-high brush in the bottom of the little valley along the side of which we were traveling. But I could hear nothing. Melvar, for once, had ceased her eager interrogation, and was entertaining me with the legendary account of the past great heroes of Astran. She sang me a few passages from the epic in her native tongue. Her voice was clear and pure and very beautiful. And though the words were strange to me, their sound was noble and suggestive, and there was a powerful, compelling rhythm in the lines. She translated the story into English. It was about such an epic poem as might have been expected, dealing with the adventures of an immortal hero, who had once conquered the Purple Ones, set up the vast palaces of Astran, and at last lost his life on an expedition across the Silver Lake to battle the Krimlu.

Suddenly her sweet voice was interrupted by a low, tense cry from Naro, who had fiercely gripped my arm. I turned in time to see a weird figure, gnarled and stooped, with long white hair, slink swiftly and furtively from a great rock to the shelter of the red brush. Squat and bent as it was, there was no mistaking that it was human in shape, and that the skin was purple.

In the dull apathy in which I was sunken, I could not realize the danger. "I guess a rifle bullet will fix it," I said.

"The Purple Ones have more power than you know," cried Melvar. "Let us try to get on more open ground before it attacks. Then it will have to leave its cover."

So we turned and ran away from the stream, to a rocky hillside, where the red scrub grew low and scant. As we ran I heard a crashing behind us. Once I turned quickly, and raised my rifle. The strange figure darted abruptly into view, and I fired on the instant. I think I hit it, for it spun around quickly, and fell to the ground. But in a moment it was up, and running toward us with an agility that was incredible, springing over the red brush in great bounds, with a motion more like that of a monstrous hopping insect than of a human being. His white hair was flying in wild disorder, his shrunken limbs plainly flashing purple. And a terrible sound came from it as it bounded along—not a scream of rage or of pain, but a weird uncanny laugh, that rang strangely over the red plain, and somehow made us pause in our race, and tremble with alien terror.

A Narrow Escape

But we broke the icy fingers of fear that gripped our hearts, and ran on until we reached a great flat rock that lay at the upper edge of the bare space, in the edge of the thickets again. I lifted Melvar in my arms until she could reach the top and scramble up. Then I looked back and saw the purple man leaping across the clearing with incredible speed, not two hundred yards away.

Then Naro and I got up on that rock—I have never been able to remember just how we did it. I dropped to my knees, seized the rifle that I had pushed up before me, and began to pump lead at the beast as fast as I could work the bolt. The recoils of the gun seemed almost a steady thrust. I heard the bullets thud into the purple body. I saw it checked or driven back by the impacts. One bullet took it off its balance and it fell. But in a moment it was racing on again, empowered by superhuman energy.

When my rifle was empty it was not twenty feet away. One arm was gone. One side of the body was fearfully torn. The purple face was a hideous mangled thing. It did not bleed, but the wounds were covered with a purple viscous slime. One of the eyes was gone, and the other glared at us with a wild red light. Anything of ordinary life must long since have been dead. But it gathered itself, and leapt for the top of the boulder.

On the day before I had showed Melvar how to use my guns, merely by way of proof that there was nothing supernatural in the working of the weapon that had slain so many of the Astranians in the temple. Now I pushed one of the pistols toward her. She was standing there motionless, calmly even. There was no panic in her face, and I knew that she would have the courage to use the weapon

to save herself from the terrible brute, if things came to the worst. She smiled at me, even as she picked up the gun. Then, looking at the safety, she gripped it in a business-like way.

As the purple monster sprang upon the boulder, I emptied my automatic into it. Great wounds were torn in the dark flesh, and half the face was shot away, but the thing seemed immune to death by ordinary means. As the last shot was fired it stood before us on the rock, a terrible mangled thing, the red eye blazing with demonic inhumanity.

Naro sprang out before me, his crystal sword drawn high. As the beast sprang at him, he cut at it with a mighty sweep of the razor-edged weapon. But the stroke, which would have decapitated an ordinary human, was parried by a terrific blow of the claw-like hand of the thing, and the boy was sent spinning back against me. We fell together on the rock.

Then it hurled itself toward Melvar. It all happened in the briefest of moments, before I could even begin to rise. She swung up the automatic with a quick, sure, graceful movement. She was like a beautiful goddess of battle, with blue eyes shining brightly, and golden hair gleaming in the sun. Again that mad laugh was ringing out, with a choking sob in it, for the thing's vocal organs were injured. It leapt at her, its lacerated limbs working like machines. Calmly she stood, with automatic raised. The muzzle of the gun was not an inch from the throat of the beast when she fired. The strange head was blown completely off the body, and fell rolling and bouncing to the red brush below. The body collapsed, writhing and convulsed. It was not quiet for many minutes.

The girl dropped the gun, suddenly trembling, and threw herself into my arms, sobbing uncontrollably. Her courage and coolness had saved us all, and I admit that I was quite as much unstrung as she after the danger had passed. What a wonderful being she was!

The Red Ship

IT was so late in the day, and we were so completely exhausted that we decided to go no farther. Naro was not hurt, save for a few scratches; and I suppose he was the least excited of the three. In a few minutes he threw the quivering purple body off the boulder and carried it and the head back across the clearing to dispose of them. When he returned we found an overhanging shelf on the north side of the boulder that would afford some shelter from the flying lights. We gathered some of the yellow fruit for supper, cleaned and reloaded the weapons, and prepared to spend the night there.

Naro called me aside and showed me a curious, much-worn silver bracelet, with a singular design upon it. He told me, in his imperfect English, that it had belonged to his father, who had been taken by the flying lights many years before. That was a curious development. It showed that there was some connection between the dreaded Purple Ones, and the terrible, pillaging red lights. But the full significance of it did not dawn upon me until later.

By that time I was in a measure accustomed to the passage of the rushing, whistling needles of crimson fire, and during the first part of the night I was able to sleep, while Naro sat up to keep watch. At midnight he awakened me, and we changed places. The sky was crossed and recrossed by the faint and flickering tracks of red, and the night was weirdly lit by the torpedo-shapes of scarlet flame that sped upon them. With a fatuous sense of security, I was leaning back against the boulder, smoking my pipe and caressing the cold metal of the rifle in my hand, dreaming of what Melvar and I might do if ever we were to emerge into the world alive.

The red thing was upon me before I knew it. The light of my pipe must have been visible to it. In my accursed thoughtlessness, that danger had never occurred to me. The thing came plunging down, flooding the landscape with its lurid crimson radiance, while the earth vibrated to its whistling, hissing scream. There was no need to waken my companions for they sprang to their feet in alarm. We all cowered back against the rock in the hope of escaping observation. But the thing had already seen us.

I put my arm about the warm, throbbing body of Melvar, and drew her close to my breast. Her own cool white hand grasped mine as silently we waited.

The red object came down swiftly, paused just above the crimson thickets before us, then settled deliberately to earth. It was the first opportunity I had had for a close examination of these things. The shape was plainly cylindrical, tapering toward the ends. It was perhaps ten feet in diameter, and a hundred long. Set on the forward end was a bright green globe, perhaps three feet in diameter.

A clump of brush about the end of the cylinder burst into flame. As the bright crimson hue began to dull, I grasped suddenly the fact that the red color was due to the red heat generated by friction with the air, which was very great at the meteor pace the thing attained. It lay there, not fifty yards away, with the fire blazing and crackling about the end on our right, and eating its way into the thickets. The green sphere on the other end seemed to stare at us like a great intent eye. The red color slowly faded. Suddenly Melvar gripped my arm.

"Why wait?" she whispered. "Perhaps it does not see us after all. Let us slip around the boulder."

But on the instant we moved a great oval space swung out of the side of the cylinder. We saw that the door and walls were of a bluish white metal, and were very thick. It was very dark inside. A blood-congealing, eerie laugh sounded out of that darkness, and I shuddered. Quickly five human-like figures leaped one by one out of the oval doorway. With heart-chilling fear, I saw, by the flickering light of the burning thicket, that long white hair hanging about faces wrinkled and hideously aged, with toothless gums, red glaring eyes, and skin that was purple. Without a moment's hesitation, the

five naked monsters rushed down upon us.

The fire was fast blazing higher and burning rapidly into the brush between us and the cylinder, and we could see the purple beasts quite plainly in its light. And they were hideous to look upon. They came toward us with monstrous springing bounds, actuated by some extraordinary force. Their muscles must have been far stronger than those of men, perhaps as strongly constructed as those of insects. Or, since muscular force depends on the intensity of nerve currents, perhaps their nerves were extraordinarily excited. And there was something insect-like in the way life had lingered in the body of the one we had killed, when it had already many wounds that should have been mortal.

I leveled my rifle, drew a bead on the neck of the foremost one, and fired. I must have had the luck to shatter the bones, for the head dropped limply to the side. The thing stopped abruptly, groping blindly about with its talon-like fingers. It seemed very strange that it did not fall. In an instant one of the others ran close by it. The crippled monster sprang savagely at the other, and in a moment they were writhing and struggling in the brush, tearing at one another with tiger-like ferocity. The others passed by them for a moment, while I finished emptying the rifle, without visible results.

Saved by Fire

BY that time the crackle of the swiftly spreading fire had grown to a dull roar. It swept fast across the brush, red flames flaring high, and dense smoke rolling up into the night. The purple beasts did not appear to see it. They made no effort to avoid the flames. Were they invulnerable to fire? Or was fire merely unknown to them as to the people of Astran?

The three rushed straight on toward us, disregarding the rushing wall of flame not a dozen yards to the right of them. I kept firing madly. The leg of one went limp, but he leapt on with scarcely diminished speed, laughing terribly, with the white hair flying about the awful face, and the purple limbs moving frenziedly. The flames rushed over the fallen two and hid them. In another instant the curtain of fire had rolled over the others, and even the ship was hidden from our view.

Suddenly I realized that we were in quite as much danger from the fire as from the monsters. Already we were shrinking from the hot wind that blew before the flames, and half choked by the acrid fumes. For the second time we made a mad retreat to the top of the boulder, and lay flat. I heard a terrible laugh from the flames, and in a moment one of the things dashed out. His hair was gone, and the purple flesh burnt black. I shot as it showed itself, and it fell. In another instant the flames had raced over it again. None of the others appeared.

We lay on the rock for several minutes, gasping in the cooler air that lingered near its surface. For a time the heat was stifling, but the scanty vegetation had burned off quickly, and soon a cool breeze came up from the south and lifted the smoke. We saw that the cylinder still lay where it had been, although the heavy body was closed. The green light still shone in the forward end. About it the earth lay black and smoking, and a low line of flame lay below the pall of smoke in a great ring all about us. Between us and the ship I saw in the darkness the black shadows that were the five dead beasts.

I was just beginning to wonder if all the crew of the ship were dead, so that we might enter and examine it, when the great oval door in the side swung open again, and something sprang out of it into the night. I heard a strange hissing, and a clatter of metal. In the semi-darkness I could see nothing plainly, but there was a floating shape of greenish mist, with a vague form beneath. I strained my eyes to try to distinguish its shape, while it stood motionless.

Abruptly a narrow, intensely bright beam of orange light shot out of it and impinged upon the rock. There was a dull thud from the rock, and the ray was dead in a moment. But the granite where it had struck was cut away—obliterated! The beam had shone straight through the boulder, carrying away, or resolving into primary electrons, the matter on which it had struck! The smooth edges of the cut were glowing with a soft violet radiance.

My rifle was at hand, and on recovering from my surprise, I fired. I aimed just below the greenish patch. Something must have been exploded by the bullet, for there was a vivid flash of white fire, and a loud, sharp report. The spot of green was visible no longer, and we saw no motion about the cylinder. At the time I had no idea what it was that I had shot. I supposed that it had been another of the purple beasts armed with a strange ray-weapon. I imagined that the bullet had struck the weapon and caused an explosion.

CHAPTER IX

The Battle in the Mist

FOR perhaps an hour we sat there on the rock. As soon as the smoke cleared, we could see the crimson needles flying high upon their vague red tracks, and we watched them with a sort of hypnotic fascination, dreading the moment when one of them would land to investigate the fate of the ship that lay silent and presumably empty before us. The ground was still too hot for us to walk upon, and we felt the uselessness of attempting to escape on foot, even if it had already cooled. With a feeling of resigned and hopeless horror, we saw one of the crimson pencils circle lower about the place, then disappear in the direction of its lair beyond the Silver Lake.

Even as the whistling roar of its passage was rolling down upon us, Melvar spoke. How I admire the courage and indomitable resourcefulness of the girl. When I was hopelessly lost in despair, feeling all the desolation of this region and the infinite remoteness of the world of men, her pure rich

voice and the warm living touch of her hand brought new courage to me.

"The Krimlu are coming," she cried. "There is no use to try to fight them, or to try to outrun them. But that ship must be empty. The walls are metal and strong. Perhaps they could not open it."

While there were several things about the proposition that were not very attractive, it seemed our best resource; and, besides, I had a keen desire to see the interior of the thing. We gathered up our equipment, climbed off the boulder, and hurried over to the cylinder. I was possessed by a haunting fear that we would find some thing hideous awaiting us, but the bright pencil of light from my pocket lamp revealed no living being in the long interior, nor could I find even a trace of the green patch that had blown up in front of the door. We scrambled through the opening without difficulty and I turned a handle that swung the heavy door shut and evidently locked it.

Then I set about examining the mechanism, for I had an intense curiosity about the propulsive force that enabled the vessel to attain a speed that must have reached thousands of miles per hour. In one end were rows of long cylinders of a transparent substance, evidently filled with the metallic fluid from the Silver Lake. Pipes ran from them to a complex mechanism in the rear end of the ship, from which heavy conduits ran all over the inside of the metal hull. While my understanding of it all was far from complete, I was able to verify a previous idea—that the strange vessels were driven by use of the rocket principle. It seems that the silver fluid was decomposed in the machine, and that the purple gas it formed, at a very high temperature, was forced out through the various tubes at a terrific velocity, propelling the ship by its reaction. The whistling roar of the things in motion was, of course, the sound of the escaping gas, and the red-purple tracks were merely the expelled gas hanging in the air.

The green globe in the forward end may have been the objective lens for a marvelous periscope. At any rate the walls of the forward part of the shell seemed transparent. And the periscope must have utilized infra-red rays, for the scene about us seemed much brighter than it, in reality, was. We could see very plainly the burned plain and the granite rock, and once, through a rift in the clouds of smoke that were rising all about, I caught a glimpse of the gleaming city of Astran, high above us in the west.

I noticed a slender lever, with a corrugated disc at the top, rising out of the floor in the bow of the ship. It occurred to me that it was the control lever. I took hold of it and gingerly pushed it back. Great jets of purple gas rushed past the transparent walls about us, and the ship slid backward on the ground. The sensation of motion was most alarming. The illusion of the transparency of the bow of the ship was so perfect that it seemed almost as if we were hanging in space a few feet in front of the mouth of an open tube. It was impossible for me to realize that I was surrounded by solid walls of metal, until I touched them. I think the wonderful telescope worked on much the same principle as television apparatus—that is, that the rays of light were picked up, converted into electrical impulses, amplified, and then projected on the metal wall, which served as a screen.

(To be concluded)

Science Wonder Quarterly

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The Reign of the RAY

by Irvin LESTER and Fletcher PRATT

Odd box-like shapes mounted the ridge beyond and they saw the flickering lightning of the Adams Ray playing havoc among the Soviets.

The Story So Far

ROBERT ADAMS, a young American scientist, builds a Coolidge tube, which gives off a ray capable of setting off explosives at a distance. A Soviet agent in America learns of it and, in failing to get the secret of it from Adams, shoots him. Adams in falling closes the switch of the tube and explodes a government arsenal several miles away. He is kidnapped to Russia where the Soviet Commissar Stenoff tries to force the secret of the tube from him. It is written in code in Adams' diary. An American secret service agent named Upton rescues Adams and returns him to America. Russia has been planning a great war against the world and knowing that Adams' escape will put the Adams ray in the hold against them, start their war immediately and begin sweeping over Europe and bombing American cities. America must come to Europe to the aid of the stricken cities with the Ray and by systematically exploding their ammunition succeed in halting the Soviets. The Soviets capture some of the tubes and therefore prevent the allies from using them against them. The two forces facing each other on the European front are therefore without the aid of any rifles, cannon or any explosives or even the use of airplanes or any internal combustion engines. They began training their armies to use swords, bayonets and the sabres of the cavalry.

Meanwhile an American has invented a motorless airplane called the Wagstaff which is deemed successful. He is killed but his assistant, Jim Blunt, brings it to the attention of the American forces. The war which rages in Europe seems to be going back to the style of the middle ages. In America there is military law under the Presidency of Paul DeKoebeck to prosecute the war and fight the civil war that seems imminent.

FLETCHER PRATT

IRVING LESTER

SIR EVELYN OLDMIXON has described the extraordinary scenes in the spring of 1934 when the German High Command, which had taken over that part of the front, was preparing for a drive on Riga. The town and the country round it were full of idle men—soldiers without weapons and almost without occupation, save the common ones of finding something to eat or something to plunder. The military authorities had almost lost their hold—only German discipline was keeping things together.

The city itself was filled with a wild medley of troops, of all arms and types. The Poles had been drilling lancers, and the best of the horsemen of this type were being gathered for the drive. They were a heterogeneous force, half panoplied in the great winged uniform of Polish medievalism, half dressed in dirty overalls. Mingled with these were squads of German pikemen and more Germans armed with spring-guns, air guns, cross-bows and every other type of tension or compression weapon that would throw a projectile. American ray men were everywhere, and Sir Evelyn's own men of the tank corps, since their weapons had become useless, had been furnished with bows, and could be seen daily practicing archery. He has recorded his emotions at hearing a Manchester taxi-driver swear when a string scorched his fingers as he tried to draw a cloth-yard shaft to the head.

A couple of Diesel motor German tanks were on hand—quite futile in themselves, as their drivers were armed with nothing more than the stinkpot glass chemical bombs to which the Teutons clung with humorless persistence. Into all this welter of men, nationalities and weapons, where no one seemed to know quite what to do, came the occasional dull plop of a Soviet long-range solid shot. They were shooting at the town from a distance of fifteen or twenty miles on the off chance of hitting something.

On the morning of April 12th the advance started. The German tanks led the way; their powerful motors could be used with generators to supply electrical current for the ray tubes and went up with the first wave of the advance. They were covered by a squadron or two of lancers and by some German troops armed with spring-guns, who were to prevent the Soviets in the trenches from rushing the tanks. After them came the main force of the Allied cavalry, Polish and German lancers and then the infantry. Oldmixon was on the right flank of the advance with his archers and a regiment of Swiss armed with cross-bows.

He has told us how complete the surprise was. The Russians had not realized how much the war had become one of mass and movement and had clung to the traditional system of lightly-filled first line trenches with heavy formations in reserve. The ray and spring-gun men cleaned out the trenches on what must have been a wide front almost without a struggle—the only foes Sir Evelyn saw during this stage of the advance were dead, contorted into odd attitudes by the ray or torn and bloody from the heavy

HISTORY tends to show that the method of warfare swings back and forth like a pendulum. The warfare of the old Egyptians as well as the Romans was certainly in many respects superior to the warfare conducted in the Middle Ages.

It is even believed in some quarters that Archimedes used a number of terrifying weapons, chief among which were the Catapult and immense burning glasses, which are said to have burned up the ships lying in a harbor quite a distance away.

In the concluding chapters, the authors of the present story have shown graphically how it is possible that armies may go back to the use of comparatively harmless weapons if warfare is only made sufficiently terrible.

Even in the World War it was necessary for the armies to go back to Roman tactics, namely, to dig themselves in behind trenches.

Incidentally, the authors have not exaggerated the possibilities of the killing ray, because such a ray has already been developed for short range purposes by scientists.

triangular bolts fired by the spring guns.

Behind the trench lines, he led his men up a long grassy slope bearing to the right where he ultimately came upon the evidences of a combat; a tank with several dead Germans and Russians lying about it and the ray-tube that had accompanied it missing. There was a complete silence about the whole scene that was inutterably depressing to those fresh from the rending thunder of war in the age of explosives. Occasionally a far-away shout floated to them, thin and ghost-like, and the voices of the marching troops were hushed, as though they were engaged on some silent and secret expedition. The whispering of the tall grass as the men moved forward added to the eerie effect of this first great battle of the era of the ray.

They must have marched for an hour or two when they came upon some Polish lancers, flying back for the lines with despatches, who called out to them in high good humor as they passed; and though no one understood what they said, there was a presage of victory in the carriage and gayety.

Beyond the crest of the next ridge was a farmhouse, where a pig had been spitted with a lance in the farmyard. They halted here for a rest in the oppressive silence while the men gathered about the barn to comment on the spectacle of a dead man who hung half way out of the window. Like the Russians in the trenches he had been killed by a spring gun, and had bled horribly down the side of the building beneath the window. Off to the left they could see more troops in the tall grass, and up ahead the figures of horsemen moved back and forth across the skyline. The whole plain was treeless, like nothing so much as a South African veldt, as Oldmixon describes it, with the cold tang of spring in the air.

After the brief halt, they set out again, marching silently among the grasses toward an unknown objective. A freshly-plowed field held them up for a moment and Oldmixon rode ahead of the men to look down the gentle slope. Then came sudden action.

In the hollow before them, a bit to their right, a dark mass of men was posted—infantry in close order. He saw an officer waving a sword, heard a thin shout, saw the column of men moved toward them. Instantly there was confusion. A runner was despatched for help—cavalry and a ray tube if it was to be had, and more infantry at all costs. Along the crest of the ridge the men were posted; the Swiss cross-bow men in front, archers behind to fire over their heads.

Oldmixon has left us a lively picture of his apprehension at that moment. His little force was quite lacking in short-range weapons—swords or bayonets. The pistol and hand-grenade had for so long been rules of the short-range combat that the matter had been simply forgotten, neither high nor low command had come to a realization of the completeness of the transition. Now he found himself on an open hillside in one of the many small and oddly-assorted battles of that stage of the war faced by a superior force and with no means of handling them should they come to grips. His only hope was to keep them at a distance.

The Russians came on at a trot, shoulder to shoulder, shouting. As they got within a couple of hundred yards, the Swiss let drive with their heavy weapons, picking their targets carefully and the whole of the Russian front rank went down in a heap. The advance was stayed; reeled for a moment, and then began to come on again, in less good order but with admirable spirit.

They gained a full hundred yards this time. The Swiss were delayed by the necessity of winding their clumsy weapons and the archers withheld their fire for accuracy's sake. Then a tornado of the long white shafts, that had wrecked the chivalry of France five hundred years before, swept across the sunny Livonian hillside into the faces of the shouting Russians. And as the ranks behind struggled through the barrier of dead and wounded in front, the Swiss cross-bowmen loosed their heavy weapons again.

The charge was halted. Oldmixon saw men in the rear pausing irresolute; others definitely flinging down their weapons and turning away from the storm of fire. The heavy column of Russians, so beautifully ordered, was drawing back into the hollow out of range, all tailed out and ragged at the edges, like a wind-torn cloud. Confused cries came from them, and the English leader was suddenly surprised to find that his own men were cheering. He felt wonderfully light-hearted himself. War was not after all the dirty business of oil, noise and fatigue he had known in Ireland.

He glanced around; his runners were still visible on the open landscape; so little time had it all taken. Further off there was something that might be distant horsemen or tall grasses swayed by the wind. The men showed a tendency to regard the victory as won and to straggle. He exerted himself to keep them in position, realizing it as a necessity, for the Soviets, though flung back, were not broken, and seemed to be working toward order and a new attack down in the hollow a half mile or so away. Oldmixon felt that his case was desperate still, and wished vainly for a machine gun or even one squadron of those caracoling lancers he had seen in Vilna, to charge down and scatter the rallying Russians.

As it was, there was nothing to do but wait. The tension of the silence was broken and jokes and calls ran down the ranks as the Red leaders slowly got their men in hand and began another advance. As they came nearer one party swung off to the left—they were not going to trust to the momentum of a single heavy body this time. Hurriedly Oldmixon consulted with the Swiss commander and made him understand in an imperfect jumble of German and English that a third of the little force was to be flung out at right angles to the rest to check this flanking column.

The Soviets paused just out of bowshot and formed. Oldmixon could see their bayonets glinting coldly in the bright sunlight—like so many on the allied side they were half-armed men now that the bullet had been taken from battle. But his men had nothing to meet their bayonets with should they come within reach. As he mused a moment, tense with the strain of waiting, there was a chorus of shouts from the Russians and on they came, headed down, like bulls.

Again the deadly storm of cross-bow bolts and the rain of arrows following, and again the heads of the rushing columns crumpled up, but this time they split in two and came right and left around the pile of their own dead with invincible courage. They came nearer, fifty yards, twenty-five, losing men by the dozen but still driving on and Oldmixon felt rather than saw a tremor run down the line of archers. But those who reached that line were a mere squad; the rest were down or reeling back a second time. Oldmixon saw one Russian with eyes like a madman's stab furiously at a man right before him who dodged crying out. The Russian went off his balance, and fell on his face. Somebody kicked his head, somebody else seized the bayonetted gun and struck him again and again.

Some of the Swiss were down and others had been wounded in this second assault, but it had been definitely beaten back, and whirled away down into the hollow, disorganized and lost.

Oldmixon tells us of how he kept his men waiting on that little ridge for an hour longer, waiting for the coming of a third attack; arming such as had emptied their quivers with guns and bayonets from the dead Russians. But the third attack never came, for before it could be formed and begun, an odd box-like shape mounted the ridge beyond the archers, and they saw the flickering lightning of the Adams Ray playing in the direction of the Soviets. Too well their enemies knew what that meant; they were quite without goggles or protective coats, and whirled off across the plain in disorderly flight, leaving their dead and wounded behind them.

CHAPTER V

Per Aspera . . . Ad Astra?

(Time—1934)

OLDMIXON'S experience of warfare in the first days of the ray was a microcosm of the greater struggle. All across Europe men were trying to kill each other with weapons not ill-adapted to the purpose, but the use of which they no more understood than their leaders understood how to combine the new arms. It was not until later that the war-flame burned up again, fiercely as of old. The English archers in Oldmixon's detachment were an exceptionally well-trained body. It is an unusual mind that can cast overboard ingrained tradition and received training; and military discipline, of all types of training to which the human mind is subjected, is the best calculated to give the intelligence a narrow conservative bias.

A new school of officers grew up, it is true; but these had the ruins of their predecessors' reputations on which to build. And by the time they came to the fore, the arms and tactics of the new era had become more stabilized. At first everything was like the battle of Vilna—confused struggling; men with missile weapons pushed forward unsupported against heavy infantry that swept them from the field; pike and bayonet men left without missile weapons to be ridden down by cavalry—cavalry frittered away in useless efforts against nothing. . . .

From this welter of accidents and errors, several main types of weapons presently emerged. The Polish lancers at Vilna showed that troops armed with this weapon were good for one whirlwind charge; but they could not stand ground, and as at Vilna, when they had delivered their stroke, the lancers were easily scattered. Hence the horseman of the new era came to be furnished with a sword and ultimately with an air-pistol as well as a lance.

On the other hand, the Diesel-motored German tanks soon proved their value as mobile fortresses from which to operate the ray when properly protected, though many of them were overwhelmed and captured by infantry by being sent out alone as at Vilna, before this was properly understood.

Infantry became divided into heavy and light; the latter with bows or air and spring guns. The light infantry first showed their value in the summer campaign of 1934 when a few formations of English bowmen, backed by pikemen from Denmark and German spring gun men, utterly overthrew the Scandinavian Communists in a great battle in the forests of Sarpsborg. By the end of the year they had won all Scandinavia for the Northern Alliance and a winter campaign carried the Allied arms through the lake country of Finland as well.

The ultimate reason for the renaissance of the bow as a weapon of war lay in the equally curious revival of armor.

For with the disappearance of the high-velocity bullet, and the necessity of some protective coating against the Adams Ray, armor made its reappearance in the form of light-weight steel plates, covering the entire body and plated on the inside with a thin film of lead to keep the ray out.

The spring guns, firing heavy triangular bullets, and the powerful type of air gun introduced by the Germans could only be fired with extreme slowness.* All the combatants essayed to use them, but after a few trials were content to use the air and spring guns merely as auxiliaries of the bow.

A company of bowmen would be stiffened by one platoon of air or spring gunners, just as a company of riflemen would be stiffened with machine gunners in the War of 1914. Half a dozen small battles showed that the air gun alone was not capable of dealing with archers on equal terms, the most striking being a Russian raid on Tirnova, in which the

* Due to the necessity of working up the proper compression in the case of the air guns, and to the need of winding back the springs of the spring guns.

attackers, armed with air guns, were simply riddled by a force of English-trained Italian archers before their slow-working weapons could be loaded and fired more than once or twice.

The bow had always possessed considerable accuracy, and on account of the arrow's whirling motion, a remarkable power of penetration.* In the hands of scientific investigation these advantages were strengthened. Bows were made of spring steel instead of wood, cords of oriental textiles impervious to moisture, arrows of aluminum alloys. Before the war had advanced another year no army was well equipped that did not have a strong force of bowmen, armed with air purposes, heavy infantry for solidity and Diesel-motored tanks as carrying cars for the ray.

But this is anticipating. The gains of the Allies in the muddled battles in the north and Scandinavia in the summer of 1934 were balanced by Russian successes in Hungary, where their fine cavalry swept through the allied line at a dozen points and went right on to the Carpathians.

The efficiency of the new Soviet cavalry led their leaders to adopt a raiding type of warfare toward the close of the year, and it met with considerable success in the southern theatre of the war, despite the broken and hilly country in which the Russians operated. To this period seems to belong the burning of Athens and the destruction of the Parthenon and the last remnants of the old Greek civilization. In the North, after the one battle of Vilna had shown the Allies how little they knew of the new warfare, both sides seemed content to sit still, drilling and equipping their troops and testing them in minor combats.

The Allied scientists meanwhile, were not idle. The first of the steel bows belong to this period, and shortly after came the centrifugal gun. By the fall of 1934 the Americans began using the Wagstaff with immense effect, for these little aeroplanes more than neutralized any attempt at surprise by the Soviets. Lacking the anti-aircraft artillery of the age of explosives, the Russians could not drive them away, and they performed their duties unchecked almost to the very end of the war. The Russians never succeeded in building successful imitations from the few that fell into their hands, the formula for the Bell & Wyatt storage battery always eluding them.

The centrifugal gun was another American invention. It consisted of a drum propelled by electricity or steam, which revolved at great speed, discharging bullets by centrifugal force. An ingenious system of synchronizing gears insured that the bullets were fired in the proper direction. These guns, though they required heavy machinery to operate them, and had no great range, were in effect like the machine guns of old, and were useful weapons when mounted on the Diesel motored tanks which could furnish the necessary power. These tanks were ultimately used in pairs, a ray tank and a gun tank travelling together and acting as protection for each other.

Thus the war entered on its third year; an old and yet a strangely new type of conflict, with armies unable to strike at a distance meeting almost by chance, raiding each other's territory, eating up the land and reproducing in modern times the conditions of the middle ages. All over Europe and America men were fighting, people were starving and the land lay fallow, while the scientists who had forgotten the name of peace were giving all their energies toward forging new weapons for war. To the observer it might well seem that humanity was on the verge of a new descent into barbarism.

CHAPTER VI

The War Behind the War

(Time—1932-1936)

THE tendency of human beings to gather within the sheltering circle of the city wall, begun in the middle ages, received a tremendous impetus from the discovery of America and the development of commerce and industry that followed. The civilization of the age was based on seaborne trade; people flocked to the points where it was carried on because at these points lay the springs of wealth—just as in the early middle ages men went to war; and, in primitive times, to agriculture.

The tendency toward congregation was accelerated by the increase of science and invention, for the articles produced in factories (and this extended even to foods) gained in importance at the expense of those drawn directly from the ground. It still further accelerated itself by reason of the host of parasitic industries that grew up at the concentration points to feed, clothe and care for the people gathered there.

By the first quarter of the twentieth century the brains as well as the bulk of civilization had been gathered in a few great cities. All the administrative offices, all the directing intelligences upon which society depended for its smooth operation, were there.

The shock of the War of the Northern Alliance fell heaviest on these points, for it was Stensoff's plan, like Tarquin's, to strike off the tallest heads. Civilization reeled, the whole structure was brought near to wreck, and when the reconstruction period came even the self-sufficient farmer found that he had been deprived of a hundred things made in cities as well as of a hundred markets for his products.

The rebuilding took place in a time of desperate struggle. Small wonder then, that the men of the day, though they thought they were following the old lines, were in actuality striking out a wholly new system. Divergences which took place under

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* As early as 1923 a kind of prophet, named Dr. Saxton Pope wrote a book advocating the use of the bow for hunting purposes, and as a result archery was to a large extent revived as a sport. He demonstrated at that time the extraordinary penetration of the arrow by killing a grizzly bear with a single shaft (something no bullet could do) and by shooting an arrow right through the finest sample of antique armour on display in a large American museum.

the spur of necessity became so deeply rooted in precedent that when the war ended there was no dislodging them. Our present social and economic organization is, in fact, that which was impressed upon us by the War of the Northern Alliance, and everything we think or do bears the marks of that struggle.

To descend from the general to the particular, take the case of England. London was practically wiped out by the Soviet bombers but Parliament was not sitting and most of its members escaped to convene at Canterbury later. They had to build up a new government, for the Cabinet and all the royal family but the infant Princess Elizabeth perished with the hundreds of thousands of humbler persons in the great catastrophe.

A Regency was named, of course. Its continued existence is due to the premature death of the unhappy princess. Amid the turmoil of a great war there was no time to examine any of the various claimants to the crown. To have settled on any one of them would have provoked disaffection and perhaps civil disturbances at a moment when the government already had much to deal with. It was determined to keep the loyalty of all parties by the legal fiction that the little Queen was still living. And when the war had ended British conservatism would hear neither of abolishing the crown nor of terminating the sham. Consequently, the fiction of a Queen Elizabeth II, alive and reigning, is persisted in to this day, with the Regency directing her affairs. If she really were alive she would be something like a hundred and thirty years of age.

A similar compromise with facts produced the other great anomaly of the British governmental system. The bombardment of Liverpool by the Irish, the workers' revolt in Glasgow, and the destruction of London removed these cities from the roll. The Regency fearful of the effect of the Glasgow troubles on the faithful industrial cities, adventured on a novel step. The vacant parliament seats which had been occupied by representatives of the three great cities were distributed among the working population on the basis of their industries —the coal miners for instance, electing the members for Liverpool; the ship-builders those for Glasgow.

To see England thus adopting part of the Soviet system at a moment when it was fighting the Soviet tooth and nail must have caused Stensoff some sardonic amusement, but the device served its purpose of binding the industrial population firmly to the government and at the same time splitting it into political parties, thus ending the power of labor as a formidable and united minority in a strategic position in the life of the country.

Meanwhile, the Regency was prosecuting the war with unremitting vigor. It bolstered up the Allies and was instrumental in the organization of the Parliament of the Alliance which now legislates for the world. It was not till 1933 that affairs at home were straightened out by the end of the revolt in the Grampians, and not till 1936 at least that the Irish were finally gotten under. That they were conquered at all was due to the Adams Ray tubes on one hand and the oath-and-deportation policy of the Lord Regent Pennyfield on the other.

An oath of allegiance was exacted from every person in Ireland. Those who refused to take it or who were found to have broken it after taking, were deported to the United States under the terms of the Northern Alliance, their places being taken by Australian and Canadian veterans. There was much heartburning over the arrangement, but the Regency was powerful and inexorable and the United States welcomed the deportees. England and Ireland were the first countries to be fully pacified.

Far otherwise was the course of events in France. Without a government, without commerce or industry, without police and with bands of marauders roaming the land in every direction, that unhappy nation was in a confusion not even exceeded during the days of the Revolution. When France again emerges into so much of tranquility that we can distinguish the course of events, we find what is left of Paris in the hands of the Communists, as well as the country south of Paris to the Loire. All south of this river belongs to the Legitimists, as they came to be called, for with the outbreak of the fighting the small body of French Royalists had thrown themselves into the scale against the Communists and by the ability of their group had become the head of the anti-communist movement.

They recognized Henry V as King of France, and all orders on the Legitimist side were issued in his name. Gradually they began to win, for though the losses were frightful on both sides, those of the Legitimists were constantly replaced by Kabyles from Morocco and blacks from Senegal, while the Communists had only their own membership to draw upon.

The Legitimists paid heavily for their victory, for the blacks and Berbers had come to stay. To dismiss them after the victory was to risk the very foundations of the Legitimist state. On the other hand there was no such prejudice against the negroes as in the United States. This explains why Charles XII, King of France, rules today over a nation of mixed mulatto, Berber and Latin physical features, speaking a rough dialect of the language of Victor Hugo.

PART IV

CHAPTER I

Retrospect

(Time—December, 1936)

THERE were three men gathered before the fire in the grate. One, whose pointed beard was grey, sat in an elaborate wheel chair and moved with difficulty; but in that broken body resided a spirit so high that after ages peoples have blessed the name of Paul de Roebeck, President of the United States. The second was a young man, slender and brown—the man of action, the right arm of the crippled President. The third, heavily

built, and with a dark, powerful face, was unknown compared to the others; yet if they represented thought and action, he stood for the information on which thought and action depend, for he was that Walker Adsill who, as chief of the Intelligence Department of the government, had accomplished such marvels.

For the moment silence had fallen on the little group. It was the President who spoke first. "Turn on the radio, will you, Herbert?" he asked, "Schofield's call this morning said a battle was imminent."

The younger man went to the back of the room and fiddled with the keys of some instrument. It shot out a premonitory beam of light, gave a few inarticulate gurks, and then burst into rapid speech, the screen by its side showing a picture of a man in grey-green uniform with the badge of the United States on his collar. He held a helmet in one hand; he seemed tired and his clothes were spotted with mud, but the expression on his face was one of pleasure.

". . . by the spring gunners of the third German division," he said, "In the meanwhile, the Russian storming column had made no headway against our centrifugal guns, and losing heavily from gun and arrow fire in front while it was charged in flank by the German cavalry, it broke up. This is probably the greatest victory of the war. The Soviet army has been thrown back toward the South with enormous losses, and Wagstaffs sent out to observe them this afternoon report that they are retreating toward Tula in considerable confusion. General Oldmixon of the British Army entered Moscow half an hour ago. The victory would have been impossible without the Wagstaffs which forewarned General Rausch of the Russian attack and enabled him to counter it. We will give you further reports as they come in."

It was the President who spoke first. "Thank God!" he said, "the end is in sight at last."

"I don't know," said Adsill dourly, "those new air guns the Soviets have are better than anything I've seen yet."

"Good enough to beat the bow?" asked the youngest of the trio.

"No—o—o—o I'd hardly say that," replied Adsill, "but they're a much improved gun."

"Oh, well—" said the younger man, "we'll catch up to them. These things go round in circles—first the bow, then the old arquebus, then the improved guns. Now we're back to the bow again, with new guns coming in. There is a little improvement in each cycle."

"Yes," said the President, "and perhaps this is the cycle in which we will end war and guns."

"You're an idealist," grunted Adsill, "War will never stop till the earth does."

"I know people have been saying that for centuries. But it has been growing less sure as each succeeding generation has brought the nations closer together. No one, not even Woodrow Wilson, would have dreamed of such an international parliament as the Alliance now has, or an international executive head, able to enforce his order, like Lord Melton."

Pro and Con

"IT wouldn't have been possible, either," said young Mason, looking up, "Without our modern means of communication. In Wilson's day it took more than a week to cross the Atlantic and there was no means of personal communication without crossing. Now we can sit in this room and talk with the other members of the parliament of the Alliance, give our votes and . . ."

Adsill's sniff was audible. "Not an unmixed blessing, I should say. Everybody in the country listens in and it's impossible to conduct any delicate negotiations."

"Why should we?" asked the President," I admit I have kept some matters secret, but these were in almost every case, technical military questions. In matters of policy I am willing that the country should know everything that goes on. You're a cynic, Adsill. Could we have developed our present system of airship lines without everybody listening in? You remember, it was an obscure Oklahoma engineer who had overheard the technical discussions who gave us our present system of landing and mooring. And it was an obscure Polish chemist who invented the safety balloonette."

"Yes," Mason continued, "I think a case could be made out for the television radio as the greatest civilizer. Thanks to it, we're internationalizing language and look what we are accomplishing in science . . . Which reminds me, by the way that EOXU of Oxford university is holding a forum tonight on the calculation of definite integrals that ought to be worth while. You might be interested, sir."

"Oh, I admit," said Adsill, "that the system has some advantages. But it stifles individual effort. Before this television radio system came about, a scientist or mechanic or anyone who wanted to work out a problem would get off in a corner somewhere. He would go to work hard because he knew that the credit and the cash for accomplishment would come to him. Now three or four hundred people in various parts of the world run in on one of these forums, each one chips in his contribution and the result is not the product of an individual effort but of a committee. There are jealousies and arguments and the man who discovers something has to depend upon his government for a reward. It's deadening. It will kill ambition and reduce everything to a level of sameness."

"But we are progressing faster this way," Mason pointed out. "It would have taken years under the old system to perfect and introduce such improvements as the Wagstaff. Now the matter is taken up by an international board of invention, each member an expert in his line, and all conferring together, and in a few months everyone is able to fly the new machines. And think of the improvement in education since the radio came. When I was a lad we had to spend six or seven hours a

day in school. Now children get it all in their sleep by radio. Why, it's done away with all that was dangerous in child labor without the necessity for legislation."

"Yes," said Adsill quickly, "and it's producing a generation of illiterates. How many children learn how to read and write?"

"It is there any real need that they should?" the President broke into the conversation. "It used to be an advantage to read and write, just as it used to be to handle a gun. But the Adams Ray has eliminated the gun, and the pictograph has done away with the book. After all the spoken word is more effective than the written. And now that we can listen to and see our stories on the pictograph, why should we bother with clumsy and dirty books, which always imposed a barrier of type between the mind of the author and that of the reader?"

"Nonsense!" declared the Intelligence chief firmly. "The pictograph is valuable only to readers of light fiction. It does away with all deep thought, with philosophy, with all the amusements of intelligent people. You can get more of Kant or Spinoza from a small book than from half a dozen pictographs."

The President laughed. "I'm afraid you've chosen a bad example," he said. "Herbert, would you mind reaching under that table and handing me the pictograph there?"

He extended the small box, hardly larger than an octavo volume, to the Intelligence head. "Look at this, Adsill. The new edition of the dialogues of Plato just issued by the Doubledays. You can put it in your pictograph machine and actually hear and see Socrates confounding the sophists under the Golden Porch. It's ten times better than reading the lifeless printed words. No, Adsill, you and I belong to a generation that is passing. The new world will do away altogether with our clumsy printed sheets, which use so many unnecessary words in conveying thoughts. It moves to a quicker and more complex tempo."

CHAPTER II

An Entry Into the World

(Time—February, 1936)

TO a man newly released from jail, freedom is rather bewildering than intoxicating. Harve Mellen, newly released from the West Virginia penitentiary at Morgantown, hardly noticed the intense brilliance of the clear and frosty winter day as the big door clanged to behind him. His shoes crunched in the snow as he walked down the slope of the hill which led to the center of the city where he could take the electric line to Pittsburgh. His thoughts were in a whirl; he was unaware of any concrete idea but that of getting away from there. Many times he had mentally rehearsed what he would do. Now that the moment had come, it found him filled with a febrile excitement.

In the back of his head, he was dimly conscious of something wrong with the two interurban electric cars that stood on the track on Morgantown's main street, but it was not until he walked up to the door of the store that served as a "Waiting Room and Station" that he realized definitely that some change had come on things. The "Waiting Room and Station" was locked, a poster advertising EXCURSION July 12, was crazily askew behind one of the dirty windows, and beneath it a small collection of long-dead flies was gathered in a heap of dust. Harve Mellen turned, a sense of unnamed disaster making his heart beat fast. The tracks of the line were red with rust where the snow left them exposed; the cars were lifeless.

He picked his way across the street to the cheap restaurant that adorns the main street of most country towns, perched himself on a stool and ordered coffee and sinkers.

"What's happened to the electric line?" he trusted himself to ask as he stirred sugar into the muddy liquid before him.

The man behind the counter glanced at him curiously. "Out of business long ago when the war started," he said, "Been up for a long stretch?"

Harve Mellen nodded, and the other turned back to his coffee urn. "You'll find things different," he offered finally. "There's the war and those nightriders. Where you headin' for?"

"Pittsburgh," mouthed Harve, chewing.

"Huh!" shortly. "Wouldn't go there if they gave me the place. Liable to get the top of your head blown off. They're going to send a train through today though. Go see Captain Rouse, fourth house on your left."

"Why do I have to see anybody about taking a train? Is there a law on—convicts, or something?"

"Hell, no, but the hills is full of nightriders. You know, the war, the Bolsheviks. Didn't you hear. They raid the towns once in a while. We don't get 'em much though. We got a couple of centrifugals in town. . . Ain't you got any labor tickets? We don't like to take money."

"Labor tickets?"

"Jez, you are dumb. Yeh, labor tickets. You'll find out. Ask Captain Rouse about it."

Harve found Captain Rouse, a pompous gentleman with sandy hair, dressed in a grey-green uniform that was unfamiliar to him, at the house indicated. He had evidently just left his breakfast, and queried with some annoyance, "Well, what is it?"

"I want to get Pittsburgh and was told to ask you about it."

"From the penitentiary?"

Harve nodded. "Don't move your head at me. Speak! Say, 'Yes, sir.'" Do you know how to handle a bow or a spring gun?"

"No sir."

"Mmm. How about a ray tube?"

"I don't know anything about them. I've been in —in the pen for six years."

"You have, eh? And heard nothing, I suppose? Let me tell you, young man, you are going to find

things vastly different. We are in a new age. Where's your fare?"

Harve produced money from his pocket in silence. "Oh, paper money. No labor tickets? What do you do? Chemist? Good. Oh, Foster," he called back through the door from which he had emerged. "Take this chap's pedigree. He wants to go to Pittsburgh."

The cryptic references to money were explained by Foster, a smiling youth with apple-red cheeks. "Paper money isn't worth much any more," he informed Harve, "and there isn't any silver money. Everybody uses labor tickets. You couldn't get half way to Pittsburgh on what you've got here, but they need chemists and I suppose Captain Rouse is sending you along. Where were you born?"

The business of the pedigree finished, Foster accompanied him along a back street to where the train stood on a switch. It was different from any he had ever seen. The engineer's cab and the coal tender were made into a single car by a connecting roof of some kind of glass, right behind which stood a black steel-armored box-car with a two-foot slit around the sides. At the end of the train was another of these armored cars, while between, instead of the familiar passenger coaches, were a string of those half-baggage, half-day coach cars that used to be a familiar feature of American railroads.

The windows of the day-coaches seemed to be composed of very thick glass, not unlike that which roofed in the engine, and near the center of each window was a small aperture. The platforms were connected, top and sides, by the same transparent covering, which seemed to lie in overlapping plates. Several men in grey-green uniforms like that the captain and Foster wore, were standing about the train, smoking or talking in the frosty air. Most of them carried long shafts of steel with cords slung from them and bore quivers from which the feathered tips of arrows projected.

"Sergeant Gowan," said Foster, stepping up to one of the men who carried no bow, but whose superior rank was indicated by chevrons and a silver whistle slung around his neck, "This is Harvard Mellen. He's a chemist, and I have just registered him as a private. Going up to Pittsburgh. Got a badge for him?"

"Mellen, eh?" said the sergeant in a flute-like voice, offering Harve a hand which he noted was curiously soft. "All right. Can you use a bow?"

"No," said Harve, "I—"

"Oh, yes. Come along. I'll give you a badge." Harve was led to the baggage end of one of the cars, where the sergeant opened a door, and burrowed inside to emerge with a three-inch badge covered with grey-green enamel, from which dangled a green ribbon. He turned to Foster, "What's his number?"

"CBYJ 134," replied the latter. "You can have him marked at Pittsburgh." Turning to Harve, he said, "Sergeant Gowan will see you through. I don't think you'll run into anything serious, although some night-riders have been reported at Little Washington. She'll tell you everything you want to know."

"She'll!" Harve realized with a sense of acute shock that Sergeant Gowan was a woman, and with eyes opened by the discovery glanced at the rest of the group. Surely that was a woman, too, and that one over there. One couldn't be sure . . .

Sergeant Gowan led the way to a car about midway of the train. The door through which he reached the platform was of the same glass as the frame in which it was set, like that of the windows, heavy and bluish in tone. As he glanced at it inquiringly, the sergeant smiled. "Glass," she said in answer to his look. "It's proof against arrows—nothing but a spring-gun will go thought it."

Mellen's Baptism

SOMEWHERE a bugle shouted. There was a bustle and the train started with a jerk—they haven't improved *that* any while I was out of the world thought Harve—and moved slowly out of the station. Everybody in the car, which just held more than a dozen people, seemed busy. The few seats were ranged down the center, the space by the windows was clear and at them some were stringing the long metal bows, piling arrows in convenient racks or adjusting close-fitting helmets of screened metal with nose and cheek pieces that supported heavy goggles. At the platform end two or three men—or were they women?—were handling what looked like a double barreled shotgun with cross pieces of steel at the muzzle.

Harve turned to Sergeant Gowan. "One thing strikes me," he said. "Where are all the guns? Are they prohibited or have people forgotten how to make them?"

She smiled again; he began to think it charming. "That's the first question they always ask," she said. "No they haven't forgotten how to make guns, but explosives aren't any use any more. It's the Adams Ray—it sets off explosives within several miles. We have two generators for it on the train. You saw the first and last cars?"

"Good Heavens!" said Harve. Sergeant Gowan had put him at his ease, and the inrush of new things on his observation had made him forget that he was newly out of prison. . . . "Why—that puts us back in the middle ages! And this war?"

"The Soviets. You hadn't heard? They bombed Washington and killed the President and most of Congress and managed to make so much trouble in the big cities that most of them are half depopulated. The Unions, you know. The Allies have an army in Russia now and we're winning, but in all these mountain districts there are plenty of night-riders yet—union miners and criminals mostly. It will take years for things to quiet down."

Harve Mellen gazed out of the window. The train was rounding a curve on the shoulder of a mountain. Across the valley a cleared patch could be seen, the fields disorderly with snow, the broken panes of the house staring drunkenly out through

black branches. "But I'm . . . a criminal," he said at last.

"Only a legal crime, though, wasn't it?" she said with a quick glance in his direction. "Bootlegging or oil stock? We don't worry about those things any more. There's too much to be done. You must have passed the commission's examination or they wouldn't be sending you up to Pittsburgh."

"No I remember. I thought it was something like the parole board. . . . But those numbers?"

"Oh, everyone is theoretically in the army now. Yes—" following his thought, "Women too. It's logical isn't it, if a country is at war, all the people are? It doesn't really make much difference. We all do about the same as we did before except that we're liable to calls, and everyone has to learn discipline and how to handle a weapon. But we would do that anyway with the night-riders around. You'll probably get a commission—chemistry is intellectual labor and the intellectual workers are officers mostly. Wait till—"

She was interrupted by a sudden clamor of bugles as the train came to a jarring stop. "Down!" cried Sergeant Gowan, pressing him into the shelter of one of the seats and with the same motion snatching a green helmet from another. As he squatted, Harve saw one of the men place an arrow in his bow and he heard the metallic twang as it was released; there was a terrific crash, a shower of the blue glass around him and something heavy struck the seat with a solid thump. He heard Sergeant Gowan's whistle shrilly blown; an arrow sang through the broken window and passed his head to stand quivering in the floor. Somebody cried out, and the man who had drawn the bow was kneeling beside him, blood spurting from his arm.

He poked his head up to look out the window and saw a hillside covered with trees among which men were moving about; one or two lay on the ground, and another, a roughly dressed man with a beard, was trying to crawl behind a tree, with an arrow sticking almost ludicrously out of his back, leaving a train of bright red blood on the snow. As Harve watched, more arrows showered about the roughly dressed man; one struck him right in the side, his limbs seemed to give out and he lay still, twitching slightly.

A heavy voice, with the metallic accents of a mechanical device, proclaimed from somewhere. "The track has been blocked with old rails. Volunteers are called for to clear it. Working party will be protected by centrifugals." Harve leaped to his feet the impulse of battle growing in him, and located Sergeant Gowan near the door. "I'll volunteer!" he cried.

She glanced at him, pointed to the door. "Through there," she uttered curtly. "Here's a helmet," There was a flash of light, a puff of choking smoke. "Watch the fire-arrows," said someone, and, with a bang of the door, Harve was out into the cold winter day. He raced toward the engine. Something struck the side of the car with a clang, and he realized with a sick feeling of fear that they were trying to kill him. His impressions became a haze of excitement.

With several others under the command of a sergeant (no woman this!) he began to haul at the rusty sections of rail that encumbered the track. He saw, in a glance at the car behind the engine, that part of the side had been lowered, and an apparatus not unlike a drum stood within. Presently it began to whirl and spit forth jets of steam; the shower of arrows about the working party decreased in intensity.

"Didn't know we had centrifugals," someone cried near him and at that moment a red shaft seemed to go right through the man next to Harve. "Oh, oh," said the man, precisely as though he were reproaching a naughty child, and slumped gently to the ground. Harve staggered as the weight of the rail they had been hauling together came on his arms, pulled, bent, and pulled again.

A shadow passed across the snow. Harve glanced up, saw something like a great bird, heard a cheer and a shout of "All over."

CHAPTER III

The Individual in the New World

(Time—December, 1936)

THE human animal has an amazing capacity for adjusting itself to conditions. To Harvard Mellen, ten months out of prison, and six years out of the world, it hardly seemed that he had ever been out of the new orbit he travelled. Like thousands of others he had learned not to go out without his ray-protecting glasses; like thousands of others he had come to regard being stopped by a policeman, desirous of seeing the number tattooed on his arm, as a commonplace.

There was hardly a ripple in the tide of life to indicate that he was living in a land beleaguered by war and revolution. His daily existence was not vastly different from what it would have been before 1930. He rose in the comfortable room overlooking Schenley Park, ate his breakfast of eggs, coffee and toast, took an hour's exercise and went to work.

The changes were mainly in little things; the coffee he drank was synthetic; his hour's exercise consisted not of a round of golf but of compulsory archery practice in the park; the newspaper he read was the chaste tabloid of 24 pages which was the only printed vehicle of news available in the city; and when he wished to spend an evening in his library, he did not take down a book, but a pictograph. If it were a story he would see the people in it and hear them speak; if it were a technical book the demonstrations would be made before his eyes, and poetry was chanted by an experienced reader while the screen flowed with mellifluous bands of color artfully contrived to express the mood of the poem.

On a typical day in December, he noted in his abbreviated newspaper a communique from the Russian front; centrifugals and cavalry had broken the Russian line and the Allied armies were closing in

round Tula, where the last strength of the Soviets was gathered; President de Roebeck had appointed a new man to the War Council; a train from Cincinnati to Pittsburgh had been wrecked by night-riders with the loss of most of its crew; a notice that train service to St. Louis had been discontinued in favor of aerial express and passenger service; a budget of small local items, and the one-inch ads allowed to every merchant who wished to advertise.

Harve went to the laboratory (when he had finished his archery practice) in an electric trolley as he would have done before the war, analyzed his specimens of iron ore and left at the ordinary hour of 17:30, or 5:30 as he would have called it in the old days. Dinner was held at a public canteen—a vast place with subdued lights, where the ubiquitous radio delivered music from a distant city or discoursed wittily on topics of the day. After dinner he went home to his pictographs, or (this being one of the days Sergeant Gowan was in town) sought entertainment at some theatre with her and afterward went with her to his rooms for an evening's conversation. To her he was never tired of extolling the new order of things.

"War and all," he would say, "we are living better lives than were possible in the old days."

"But isn't it a fictitious prosperity," Sergeant Gowan would argue, with a woman's tendency to conservative misgivings. "Wars are like fevers. They always bring a temporary flush."

"Not this one. The flush is due to inflation of the currency, and you can't inflate a currency that is based on work and not on wealth, because you can't increase the amount of labor that is done."

"And don't you believe that peace will put many of these workers out of work? It always has."

"I doubt it. There are so many hands needed for rebuilding. Our system is better, too. Take the case of the laboratory where I work. We have three stenographers. Work is slack just now, and has been. Under the old system, one of the stenographers would have been turned out to spend seven or eight weeks hunting for a job, and we would have lost that much labor. As it is, Colonel Macy merely reports that he has an extra stenographer, and she is detailed to the McCreery store where they need more for Christmas. It's all so much more efficient."

"Yes, but in gaining this efficiency, haven't we lost some of the finer things? Perhaps I'm too young to know," she smiled, "but it seems to me that there was more elegance, more easy living in the old days. I remember what good times we had at home when we were children and my mother never had to work. That sort of thing."

"That was just the trouble with the old days. Our civilization was elegant because it was becoming decadent. Everybody was too busy having a good time to think of serious things. Life was getting itself filled up with little hypocrisies and lies, and growing more and more rotten at the bottom. We needed this dip into the primitive to clear the air. When life and death are immediate problems there isn't time for gossip. For instance, you wouldn't have dared to visit me here; it would have ruined your reputation and our friendship. I'd have had to marry you and we'd have hated each other for the rest of our lives because we had been forced into it. Now everyone is too busy to care."

"Admitted. But what about books and art and that sort of thing? We aren't producing anything new in that way. All the pictographs are of the old authors."

"All that will have to come later. We're merely starting. Do you ever read Darwin or Ellsworth Huntington? They will tell you that a race always declines unless natural selection has a chance to operate. Under a civilization like the one we are leaving behind, the unfit are preserved and even get to high places. Now we're eliminating the unfit. We're back to barbarism for a minute; we have to be, that a finer civilization may rise out of the ruins."

"Are you so sure that the new civilization will be finer?"

"Well—yes. The unfit are going. Who would have dared to suggest that criminals be sterilized in the old days? Or idiots? But it's done every day now. And look at the decrease in insanity. There is fighting going on but no murder—at least not as there was. The mechanical basis of our civilization will be more secure, too. Think of the tremendous waste there used to be in the old days, when a man could buy an automobile one month and trade it in for another the next. Now if he wants to get a new machine, whether it's a Wagstaff or an auto, he has to get permission, and all the time and labor that went into producing the unnecessary machine is put on something useful."

"True enough, no doubt. But still, I think we're losing something. Where is our democracy? Don't you think the men who wrote the Constitution would hate to see us now, with everyone in the country enrolled in the army and under orders? And where are our state and local governments? There hasn't been a mayor of Pittsburgh in four years."

"But democracy is not so much a form of government as the spirit behind it. England was as democratic as it could be under a king. Even before the war the old form of a big, unwieldy congress always quarrelling with and impeding the president was breaking down. There were too many laws Honestly don't you think the present system is better? No one is losing anything by not voting. Here I am, for instance, just out of prison, and I'm already a captain. There was nothing like it before. . . . By the way, I'm to try my examination for promotion to major next month."

"Oh, are you? I'm glad. You'll be a colonel soon, and won't be able to speak to a mere sergeant. . . . But about the system, I don't know. Didn't the Chinese have something like that, years ago? Examinations and promotion and more examinations, till it was all a matter of memorizing things and

their civilization became stagnant. I'm afraid we're going to get something like that—a mere rule of efficiency, in which the individual will be a kind of robot."

Harve Mellen mused. "That's on the knees of the future," he said finally. "Perhaps you're right. . . . Still—" he flung out his hand in an expansive gesture. "This doesn't look like it."

Margaret Gowan looked about her at the room with its dark furniture, rows of pictograph books and soft carpet. Out the window the lights of the city were visible across the park, like planets against the velvet black of the Monongahela hills. Along the crest where houses had been before the revolution, the gaunt outlines of an electric brick-laying machine stood against the sky, while beyond them soared the orderly row of lights that marked the passing of the night aerial express for St. Louis and San Francisco, a symbol of new hopes and enterprises rising out of the wreck of war.

THE END

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The Boneless HORROR

RAYMOND HILLIARD

miles going upward in perfect harmony.

CHAPTER I

An Emperor's Wish

THE Emperor of Gobi sat proudly on his marble throne.

Below him on the Steps of the first Magnitude sat the Seven Wise Men, on whom the Emperor depended for the welfare of his realm and the continued power of his dynasty.

And on the other Steps of Magnitude, of two down to seven, stood the nobles of the realm, all of them selected because of some brilliant achievement adding to the splendor of Gobi.

One after the other the Seven Wise Men read from parchment scrolls the record of their departments for the past month, and the Emperor praised them for all for what they had done; especially did he give credit to the Royal Mathematician, the Royal Engineer and the Royal Geographer, for these three men, separately and in unison, read of the plans that they had prepared for the destruction of the Land Of Mo, that great Kingdom of the South, which dared to dispute with Gobi the supremacy of the world.

The Emperor of Gobi had issued orders that Mo must not only be conquered, but actually destroyed, and for months the three Wise Men in charge of these departments of Mathematics, Engineering and Geography had studied over the problem. Now, they had a plan, and it was a good plan, and at the end of it Mo would be no more.

There was one flaw in the beauty of the plan; namely, the time that must be taken to accomplish it. Tunnels had to be dug under the sea, and under the great gulfs of water, separation had to be made of Mo from Gobi, and even though all of the slaves and all the machinery and the great skill of Gobi, though all these were put to work, still, years would pass before the desired end would be accomplished.

So, the face of the Emperor darkened, for he was now passing his fifty-ninth birthday, and he knew that ere thirty more years faded away he and his Seven Wise Men, and all who had helped him make Gobi great, would be worm food and dust in their golden coffins, or else so old that their greatest worry would be the dragging of broken bodies through another day.

Of all his illustrious fathers, but one thing remained certain, and that was that they lived a while and then died.

And thinking thus, his face grew hard and sad, and he chewed the end of his mustache in such a way as to make the Royal Barber tremble. Finally he cried:

"All of your plans are folly and your thoughts foolish vanity, for who of us will be here to see this ending of our enemy thirty years from now? And what comfort if a few of us live on, yet lack the mental power to glory in our triumph? Give us youth, take away from us the weight of the years gone by, and there would be satisfaction in the perfecting of your plans. Give me youth! Take from my shoulders the weight of years, from my head the whitened hair, from my face the little wrinkles, fateful handwriting of Time the Conqueror, and then you can destroy Mo. Which of you Seven Wise Men can make a man young?"

DAVID H. KELLER, M.D.

WHEN we pick up one of Dr. Keller's stories, we may always be assured of something unusual—of a new and stimulating chain of ideas. This month he treats us to a charming little romance, so out of the ordinary—so different from the usual science fiction stories, that it is difficult to classify it.

History shows that civilizations have their cycles, swinging back and forth from barbarism to a high peak of science and culture and then back again. Scientists are certain that extremely high attainments in civilization were reached any number of times during the life of this planet. How high they may have gone, the author has attempted to depict in this present adventure. We know you will like it.

Silent, the Seven looked at each other, fiddling their fingers and toying nervously with their dragonian rings, emblem of the immortality, that they believed in but lacked. The Dragon, swallowing his tail, the never ending, ever beginning, symbol of fadeless youth, made the golden ring sacred to the Seven and to their Emperor who had a ring like theirs, (only his was carved from a single garnet, while theirs were only gold).

Then the ruler from his throne commanded that seven of his slaves be brought in, and these he had his Chief Executioner kill in seven various ways, by the silken cord, decapitation, the bleeding from the wrists, the pouring of molten lead in the ear, the golden needle stuck slowly past the eyeball, the placing of one drop of poison on the tongue, and, finally, the frightful death by command, wherein the Mighty Ruler orders that the man die, and he dies from fear of being disobedient.

The seven dead bodies of the slaves lay stretched on the floor of the palace, and the Emperor rose and whispered,

"I can give death, but I cannot make myself live on till I see the ending of Mo. Listen, Seven Wise Men; am I Ruler?"

The seven bowed low before him.

"Then pay attention. Meet me in three months, and at that time tell me how to prolong my life tenfold so I can glory in the conquering of the country that I hate so much. Do this, or I shall kill the Seven Wise Men, and other men will take their place and wear their dragonian rings. And

the manner of your death shall not be as easy, as was that of the seven slaves. But you shall be weeks in the ending of life, and all the time you shall have due cause to reflect over your lack of intellect, in that you could not make me live on long enough to glory in the fall of Mo. You are all wise men, and you have worked well for the Land of Gobi, but all of your wisdom will not suffice unless you give this immortality to me."

The High Priest's Story

THEY bowed their heads and withdrew from his presence, stepping aside so that their silken robes should not touch the dead bodies of those who had died to teach them how they could go on living.

Other slaves came and removed the carrion, and the Nobles left the great hall. At the last, only the Emperor sat there. He rang a gong, and at that summons came the High Priest, a man who knew all the wisdom of the Gods, and what he did not know he would not admit. And the Emperor permitted him to sit near him.

"Tell me again, Norazus," the Emperor asked, "about the dragon, whose ring I wear."

"This dragon lives far to the North of Gobi," the High Priest began. "He lives perpetually, with his tail in his mouth, thus, never reaching either an ending or a beginning, but going in a circle, which is an emblem of eternity, of immemorial, immortal life. Yet is he nothing like everlasting, for every seventh year he lays seven eggs in the sands of the desert, and of these seven he selects one which he swallows, hatching it out in the heat of his stomach, and when it ripens, the new dragon eats the old one and emerges from his inner gut, but in his body is the soul of the old dragon and in his head the wisdom of the ages. And, thus, is the life of the dragon renewed every seven years by means of a new body, but the skin of the old dragon lies dried and bloodless on the ever shifting sands."

"A pretty tale, Norazus, but is it true?"

The two men looked at each other. Then the Priest whispered:

"What if I showed you eggs of the dragon, some of the six that he discards and leaves to turn to stone in the sand?"

"Eggs or stone, what boots it? How can you tell the dragon egg from the giant auk, or the dodo, or other birds that my wise men prate of?"

"Some things must be taken on faith."

"What is that? A bubble for children. We are wise. I wear this dragon ring, because it is the emblem of power. My Father and his before him wore this ring, but we must seek elsewhere for life everlasting. The dragon may know how to renew himself, but we cannot use his power."

"Have you benefited from the daily blood of a new born child?"

"Not much. In fact, I fear that it has harmed my appetite. The meals are not as good as they were before I took this tonic. Several times I have belched, making necessary the death of my cook. No, Norazus, let us wait till the Seven Wise Men report on their method of prolonging life. Whatever they advise, I will share it with you and with them. But we shall never learn the secret of the Dragon or of the Salamander or of the Phoenix, who buildeth a fire for a new life through the burning of the old body. Not in such forms must we seek added years. And I must live to see the ending of Mo."

At that time there were three great Empires in the world. Atlantis occupied all of the land west of Ireland, an island reaching far west, till from its furthermost shores the coast of America showed as a purple haze on the horizon. From this country went emigrants to Egypt, Greece and the other countries of the Barbarians, bordering on the Great Sea.

The Empire of Mo filled in all the great waste that is now covered by the waves of the Pacific. To the west, it was separated from Asia by three hundred miles of water, but on its eastern borders it was almost in touch with Central America. It had colonies all through North and South America, but the largest of these were in Central America. Some of these colonies were commercial, others were to spread the service of the All-Good-God, whom they worshiped diligently, and one, in the valley of the Colorado River, where Arizona now stands, was intended for a city of refuge, if at some future time (as the dismal priests believed) all of Mo should be destroyed.

The third great Empire was Gobi. This kingdom occupied all of Asia, at that time a low land, covered with fertile plains and dark forests. There were little rolling hills, but the Himalayas still slumbered unborn in the womb of the earth.

Of these three countries, one gave, before its destruction, of its learning to Egypt, which, in turn, made the culture of Greece possible. Mo, most brilliant of all three, as far as learning was concerned, died so quickly that nothing remained save a dim memory in the places where once her peoples had ruled in their might; while Gobi, shattered by a grim cataclysm, managed to live on in the desperate cold and barbarous country of Thibet. The three lands died together; man lived, forced by circumstance to forget all that these countries ever knew and learn it all over again. Gradually, humanity rose in the scale of civilization, and by the time fourteen thousand years had passed, man had relearned perhaps half of what he knew before he had destroyed the three fairest empires that the world had ever seen.

CHAPTER II

The Wise Men Found One

AT the end of three months the great men of Gobi met again, but this time no plenteous splendor marked their gathering. Secretly, they met by night in the bowels of the earth, many feet under the Palace, in a room that only a few of each generation knew of and which none ever dared to name above a whisper. It was a room of black

marble. Around the walls were nine dragons of red stone, and from their eyes came a glow that lit the room. In the belly of each dragon was a seat. Thus, there was a seat for the Emperor and one for each of the Seven Wise Men and one for the High Priest, and on the floor sat a blond man of about thirty. His eyes were blue and his hair flaxen, and there was an unafraid look on his face, for on him there were neither bonds nor fetters.

The Chief of the Navy of Gobi began the tale of the stranger.

"Oh! Most Illustrious Emperor, Representative of the Dragon in human form, Wearer of the ring: when you commanded us to find for you the secret of longevity if not even that of immortality, each of us went his varied way to find the answer to your command. To me came the inspiration to search the sea between our land and Mo, in the hope, that among the prisoners whom I might capture, there would be a man of learning in the art and sciences of the cursed country of our enemies. In order to examine those whom we captured, I took in our fleet one of our learned men and other men, skilled in obtaining the truth from such persons, no matter how unwilling they are to disclose it. We cruised for some weeks, and took several vessels which had sailed too far from Mo for their safety. Of those whom we captured, we killed the most, either as ignorant folk, or else stubborn ones who died when the tormentors began to work on them. However, we were fortunate in obtaining one of their physicians, who, when he found what we wanted, claimed the power to lengthen life. This man you see here; if his ability is equal to his boasts, he can satisfy our desires to prolong the life of your Highness."

Heracles

THE Emperor looked thoughtfully into the face of the young man.

After a long pause he asked:

"Have any of you Seven Wise Men questioned him to find wherein his power to prolong life lies?"

"We have done so, Your Highness," replied the Royal Physician, he who knew more about the healing arts than any other man in the realm. "I talked over the matter with him."

"And what opinion did you arrive at concerning his method?"

"It has all the elements of philosophical truth in it."

"But will it really work to the lengthening of life?"

"That cannot be said without a trial."

Again silence, filled with suspense, covered those in the mystic room, the sacred Hall of the Dragons.

And then the Emperor asked the young man:

"Are you a man from the land of Mo?"

"No, I come from far away Atlantis."

"How came you in a ship of Mo?"

"Years ago, as a child, I was taken prisoner from my home, and since then I have lived in Mo. They thought that they saw in me astonishing aptness to be a physicker and a dealer in drugs and magical healings; so, they taught me all that they knew, and, of all the young men in their college of medicine, none knew more than I did. And when I was taken by your ship, I was voyaging to a far land to heal a mighty man of his disease."

"So, you have no tie of love for Mo?"

"Why should I, when they killed my family and took me from the home of my childhood?"

"Would you stay with us?"

"One place now is as good as another, since I cannot be a free man."

"But suppose I make you free? Give you a place at my right hand?"

"It would all depend on what was in your right hand," answered the young physician, and there was no fear in his eye as he said it. "For I have been in the presence of the King of Mo and I have seen mighty ones sit at his right hand and die there, from poisoned wine and the silken cord around their neck."

The Emperor frowned, for even so did great men die in Gobi.

"Can you make me live beyond the age of common men?" he finally asked, and in his words was a great longing for years sufficient to see the ending of Mo.

"I can."

"How?"

The young man eased himself on the floor and then spoke his answer.

"The life of the working bee is six weeks. It works that long and then it dies. Mo is full of flowers, and the bee is there a sacred insect, and for centuries the Royal Bee-keepers have studied the habits and manners and diseases of these bees in the Royal Hives. So they know that the working bees live six weeks. But the Queen Bee lives for five and sometimes six years, and all those years she is lively and full of vigor and does her work in the world of bees with a healthy constitution. Long years ago this difference was seen in the relative age of these bees, and the men who worked with the bees tried to lengthen the lives of the workers so that more honey could be produced. But no one was able to tell why one bee lived six weeks and another five years. And then I was told of the question and how the wise men had failed to solve it, and I worked on the matter, and now I know why the Queen lives so long. It is all a matter of the food that she eats from the time that she first crawls from the broken egg shell. This feed, the queen jelly, has in it the elements of immortality. I think if she were protected from the younger Queens, she would never die, but the time comes when she is killed, and perhaps that is best for the hive—but, at least, she lives a life that is nearly two and fifty times as long as the existence of the working bee, who eats what he can and when he can, and dies after six weeks of toil."

And thus, as the young man came to the end of his talking, the Emperor replied:

"Would such food work on a man?"

"I think so."

"But how could it be made in quantities to keep a man alive? We have no bees in Gobi, and if we had, it would take large numbers of hives to make a meal for a man."

"When I studied this queen-jelly, I made thereof an analysis, and found of it the various components and their amounts and the formula of the making. I can take the blood of a bull and the fat of geese and the oil of the turtle and the flesh of certain fish, and, by a way that I know of, I can make a food in abundance that will do even as the food of the hive. This food I have tried with creeping things and flying things and little mice, and all of them thrive on it and their life appears to be greatly lengthened. This I can make here in Gobi, if I have a place to work and dishes of glass and of gold and all the parts of the formula brought to me. And I will make the food, and this food you shall drink and eat and nothing else. Some of it I will flavor and serve solid, and others will seem like wine, with the perfume of the vine and the poppy, and in every way your thirst and your hunger shall be satisfied, but this only shall you eat and drink and nothing else."

"You shall have what you need to work with!" swore the Emperor with a horrible oath, "and I shall eat and drink of the food and so shall these Seven Wise Men, and so shall this High Priest, and so shall you. We ten will eat and drink of this food, and we shall see the ending of Mo and the destruction of our enemy, and because of this thing you shall have great honor and shall sit at my right hand, and all the people shall reverence you. I will give you land and places of beauty and things to delight your soul, and you shall be the child of my old age, and the ten of us shall one day gather here in this Sacred place to hear of the ending of Mo. And now, you Seven Wise Men, harken unto me, and do as I command, for, even though your bellies are filled with this bee food, yet, can your throats be cut as easily as ever. Give this Physicker all that he demands, satisfy his every desire, aid him in every way. Do this first, and after that, use all your power for the hastening of the destruction of Mo, for life will be tiresome to me, so long as they rule in splendor all over the South Seas and deny me the right to levy taxes and take tribute from them."

Thus, the meeting came to an end, and all of the Seven went and worshiped their special Gods because a way had been found to prolong their Lord's life and thus permit them to live longer with their sons and their wives.

Heracles, the wise young physician from Mo, was given a place of his own, with special rooms to work in and others for him to live, and all of the wealth and wisdom of Gobi went to aid him in his work. Assigned to help him were certain young men, who labored for him as he commanded, but the final preparation of the food was done in secret. At the ending of the third month the first supply of food was made and ready to feed the ten, who were appointed to eat of it. In every way it was delicate and delicious and dainty in its taste and smell and in the pleasure that it gave to the tongue and the palate. The Emperor was pleased, and sent a dozen dancing girls to Heracles as a present, and each girl bore on her body jewels that would have served as a King's ransom. Heracles put the jewels in a place that he knew of and the girls in his harem and promptly forgot about both, for he was engaged in a mighty work.

After that, the Emperor and the Seven Wise Men and the Priest ate all their meals together, though, after he found that the food was healthful and not in any way poison, the Emperor would at times excuse the Physician from attending at meat with the others, as he knew how hard he was working, preparing food for all of them. And yet this absence from the Royal table caused the Emperor sadness on account of the great love that he was holding for the young physician.

CHAPTER III

Counter Plans

MEANTIME, the wealth and manpower of Gobi was working as it had never done before. To the North and West lay the Kingdom of Gobi, while to the South and East, for more miles than man could measure, was the beautiful land of Mo. Sixty million men and women of power lived in that land, besides untold slaves and common folk. Between the two lands rolled three hundred miles of ocean. Neither country could transport armies large enough to conquer the other; each grew in greatness and wealth and hatred of the other. They knew of Atlantis, the third kingdom, but that land gave neither of them concern, for her ways were peaceful and her ambitions more in the conquest of art than of other nations.

Gobi determined to destroy Mo.

Mo brooded over the ending of Gobi.

Each used all the skill and energy and determination that it possessed toward the accomplishment of its purpose, and, while each had a partial idea of the plans of the other, they both laughed at the impending danger, because it seemed so fantastic.

The plan that Gobi was working out was simple and yet gigantic in its scope. It was nothing more or less than to blow her enemy to pieces. Tradition and the ancient wise men whispered of large caverns under the land of Mo, huge reservoirs, ten miles under the surface of the land, and these were filled with explosive and inflammable gases. It was believed that the entire land of Mo rested on a thin crust of earth, and that beneath that crust were vast caves, large caverns, tremendous open spaces. filled only with threats and sullen murmurings from the hidden fires that lived silently so many miles below. Mo was existing on a living Hell. Unconscious of her danger, she laughed and sang and loved, while beneath her a scarlet doom waited, with endless patience, the signal for its release.

This was the way that the land of Mo was built,

and on this fact the Seven Wise Men of Gobi formed all their hopes. Their plan was simple in its scope, though it would take years in its working. It was nothing more or less than a tunnel under that three hundred miles of ocean, and then from that tunnel a dozen side tunnels, till all of the land of Mo was burrowed under, even as a mole works in a garden after worms. Then, at the end, deep shafts were to be sunk, till the fire of the Pit made it impossible to work longer, and in these pits powder was to be put, not just pounds or yet tons, but all of each of the twenty-seven vast pits were to be filled with explosive, and the lateral tunnels were also to be filled, and even part of the tunnel under the sea.

And this powder was not the kind that is made of saltpeter, but was of a power that was so great in its might that even the men of Gobi dreaded it; no greater punishment could be given a criminal than to be sentenced to work in the houses where it was made.

All the dirt from these tunnels had to be carried back to the mouth of the tunnel in the land of Gobi, and there it was piled in long rows, and the mountains thus made are still to be seen in parts of Asia, though few knew how they came there.

The finishing of this tunnel and the placing of the powder would take thirty years, but the actual exploding of the powder would be but the time of the taking of a deep breath, though it would take a day for the final distant charges to be exploded, such was the great distance to the far parts of the land.

Only a part of the destruction would be accomplished by the powder's exploding. The flames from this would light the large caverns of lethal gases, and these would explode and blast holes into the very Pits of Bottomless despair, and from these pits would come the fire of Hell, and what that fire would do to the hated land of Mo could hardly be guessed at.

Part of this plan had reached Mo through its secret spy system, but it was so fantastic, so peculiarly impossible in its greatness that little attention was paid to it. Besides, the inhabitants knew that it would take years for Gobi to dig such tunnels under their land and under the far corners of their kingdom, and before that time had come they had a very pleasant surprise to hand to Gobi, which would make the wise men of that land have plenty to worry about, besides spending an eternity of years, digging tunnels under the sea.

For there were also wise men in Mo. Perhaps their wise men were possessed of more wisdom than the Seven Wise Men of Gobi, though at the present when, fourteen thousand years have passed since both lands died and lost their wisdom, it is hard to evaluate such a delicate matter as the intelligence of a nation. However, what happened nearly confirmed the boast of Mo, that they would win a victory over their enemies before those enemies could come to an end of their tunnel.

Now, it is an interesting fact that the men of Gobi knew of the plans of Mo just as the men of Mo knew of the plans of Gobi. Each had a partial idea of how the enemy was going to attack and each felt that the schemes were impracticable and foolish. For it is no wonder that the Seven Wise Men made a special report to the Emperor of Gobi and in that report told him that Mo would try to destroy them, but that the method was an impossible one and opposed to all the known laws of nature. To be brief, Mo intended to have the laws of gravity set aside for a brief period over the entire land of Gobi, with the result that the land, no longer held down by gravity or the weight of the atmosphere, would leap into the air and leave the entire kingdom miles above the ocean in an atmosphere of bitter cold, where pleasure would cease and men would be so occupied with fighting the winter that no time or energy would remain for the pursuit of pleasure or the softer recreations of life. The People of Gobi would have neither time nor energy for building tunnels to destroy Mo. If they remained in their former land, they would have to fight the cold; if they left it, they would have to fight the Barbarians. Meantime, the gentlefolk of Mo would continue to live in pleasure and a warm place under the tropical sun.

Thus, each country lived in what proved to be a fool's Paradise.

Yet, not all, for the Emperor of Mo had built in the far East a special retreat and a place of refuge, and there he and his rich men and their wives went for six months every year, when the summer sun was the warmest in Mo. Many centuries before, it had been foretold that when Mo was destroyed, it would be during the period of intense heat; and now for several decades the chosen few protected themselves against such a fate, even though they laughingly told each other that it was impossible.

The plans of the wise men of Mo were not as fantastic as might be imagined. Even today, in our dense ignorance, there are East Indians who can suspend themselves in the air in absolute defiance of the laws of gravitation. If a man can do this now in our dark ages, why should not a field or a forest do the same at that time when men knew many things of which we are ignorant? At least, what really happened was this. Heracles had not come to Gobi by accident. His capture was simply a part of the plans of the conspirators of Mo. Had he not been captured on ship board, he would have come to Gobi anyway. His ability to make the life-prolonging bee jelly was just a happy incident, something happy in its occurrence, but, at the same time, such was the wisdom of this young man that had almost anything else been asked of him, he would have been able to give a satisfactory answer. He had come to Gobi to lift that unhappy country three miles of more into the air; his making of the bee food simply made it easier for him to carry out his plans. Now, as the trusted friend of the Emperor, in fact, as the man who was making his royal food, he had full access to every part of the Kingdom of Gobi.

Heracles' Plan

IT is easily told what Heracles did. How he obtained his results cannot even be guessed at, but there is this to say, that if any wise man of today duplicated his experiment, there would be no similar result; so, it must be true that this man of Mo knew something that the scientists of today do not know. All that Heracles did was to set aside a room, and in that room no one came but himself. In that room he built, with his own hands, a table on four legs, and the top of the table was near the floor. The legs were telescoped so that when air was released into them from a tank, where it was stored under pressure, the table slowly rose into the air till it came near the ceiling of the high room. On the top of this table, Heracles built, out of sand and stone and little painted pieces of wood, a replica, or relief map, of the Empire of Gobi. When the time came, he intended to raise the table, and even as the table rose in the air, so would the entire land of his enemies rise.

The plan was perfect, and, yet, at the very end a little thing destroyed the perfect consummation of it, and allowed matters to end as they did.

To select this room, to secretly build the table and the tank and the apparatus for compressing the air and to make a perfect duplicate of the Kingdom of Gobi on the top of the table, took time. Even in his moments of greatest fancied security, Heracles could not relax his caution one moment. Every piece of wood and metal had to be carried into the room under his flowing robes, or at the dead of night, and, at times, a year passed without his being able to even enter the room, for often the Emperor insisted on trips of inspection to the far corners of the Kingdom, and on these trips he was careful to see to it that the Seven Wise Men and the Priest and the Physician accompanied him.

Meantime, the years passed. The special food, the nourishment of Queen-bees, the only nutriment of the Emperor and the Wise Men, was working admirably in every way. The Emperor was not only retaining his original age, but he seemed to be growing younger. It was rumored that the High Priest, who had been nearly ninety at the beginning of the experiment, had become a father through the aid of one of the ladies of the Temple. There was no doubt about the rejuvenating value of the food.

Thirty years had passed.

These years had not been idle. Thousands of men worked to destroy Mo, while one man patiently worked to destroy Gobi. Meantime, the Emperor of Mo spent more and more time in his special retreat under the mountains of Arizona. In a Royal trireme, he would sail east till he came to the mouth of a large river, the one that is now called the Colorado. Up this he would sail to a harbor, from which place the royal elephants would carry him and his escort to the mouth of a tunnel. There, he changed to litters, carried on the shoulders of slaves, and for twenty-seven miles under the massive mountains, the slaves would walk on a pavement of red sandstone through a tunnel, illumined by the torches of marble slaves who patiently stood in almost endless rows. The light from their torches never varied, and was cold. Since then, the secret of a cold light has never been rediscovered.

At the end of the twenty-seven miles, there came an end to the tunnel, and there, in a natural crater was built the splendid royal city. It was a small place, there being room at most for a hundred of the nobility and their servants. But in that little city was the wealth of the land of Mo. For seven hundred years each Emperor had carried there his finest treasures and left them there. Such was the place in which the great men of Mo waited for the prophecy to come true; from there, every six months, they returned to Mo, glad that another year of safety had passed over them.

CHAPTER IV

Heracles is Ready

YEARLY, and half yearly, Heracles sent messages to the King's Councilors at the capital of Mo, reporting his progress and warning of the dangers that threatened the country, but concerning most of these warnings, little attention was given, while the certainty of the destruction of Gobi was fully believed and occasioned much joy.

Finally, at a meeting of the Wise Men of Gobi and the Emperor, the time for the finishing of the tunnels and the exploding of the powder was determined, and it was announced that in one year this would take place. This announcement filled Heracles with boundless determination to finish his work and, thus, prevent the destruction of Mo, by first hoisting Gobi into an eternity of cold and snow. Of the work that he was doing, little remained unfinished. One or two more nights would see an ending of the preparation, and then Gobi would be destroyed.

But not at once.

Heracles was not content with simple destruction. The years of study, the sacrifice of a lifetime among strangers had filled him with the determination for a deeper and more terrible vengeance than simply the freezing of his enemies. For thirty years he had plotted this vengeance; for all those years he had studied and planned and experimented, and now he was prepared to begin a deed that would strike terror to all the people, and, in after years, when it became known, would place the name of Heracles, the Physician of Mo, among the names of the Great of the whole Earth.

During these thirty years he had fed the Emperor and his Seven Wise Men and the High Priest. He had fed them and given them drink and nothing passed their lips save what he prepared for them. Years of wonderful health, boundless vitality and splendid vigor gave these men the greatest confidence in the honesty and integrity of the man who fed them. Now, Heracles, with their fate in his hands, prepared for them a future that was so dif-

ferent from what they had expected that not even their wildest dreams could anticipate it.

And in preparation for this fate he held a long secret converse with his friend, the Emperor, and warned him of the danger of the explosions that they were going to make. Once the bowels of the earth were teased till they vomited fire, it was hard to tell where the trouble would end. Would it not be best to prepare the Hall of the Dragons with beds and food and all necessary luxuries, and retire there with his Wise Men before the electric spark was fired? Would it not be wise to have the wires run into the Hall of the Dragon so that the Emperor himself could have the joy of personally pressing the golden button and, thus, all by himself, have the satisfaction of blowing the Hell of the Bottomless Pits into the faces of his enemies of Mo?

The Emperor was delighted with the plan. He agreed to all that was suggested. He even went further and arranged for a month of entertainment in the Hall of the Dragon, consisting of feasting and amusements, and the delightful killing of slaves in strange and unusual ways, and he gave orders that for all that month he and his Seven Wise Men and the Priest and a few of the Nobles should lie on golden couches, on pads of goose feathers, covered with fine velvets and silks, and there, they would drink the wine and eat the bee-food that their friend, Heracles, prepared for them. And, when the time came, the golden button would be pressed and Mo would be destroyed. And when it was safe, they would go to the sea-shore and sail over the land of their enemies to see for themselves the deadly fate that their energy and hatred had prepared for them.

Now all was to the liking of Heracles. A month of drunkenness, during which he would work his final plans. Then, on the day before the pressing of the button, Gobi would move slowly into the air—and what cared Heracles how long the Emperor of Gobi and his advisers lived, so long as they lived the life that he prepared for them?

Thus, at the beginning of the debauch, Heracles changed the food. It tasted and had the fragrance of the former food and wine, and it still contained large amounts of the Bee-jelly, but, in addition, there was opium added to lull their senses and allay their suspicion, and hyoscine to make their dreams more pleasant, and, finally, a secret compound, made from the internal glands of actual men and women, collected carefully during all these years from the bodies of slaves and criminals condemned to death.

And this medicine, given in proper doses, melted the bones of those who took it, so that finally they became boneless bags of skin, within which bags they lived and thought but could not move, simply lying where they were placed till someone placed them in a different shape.

Men in their normal minds would know of the changes taking place in their bones; men, walking or taking exercise, would have fractures and strange changes in their shape, due to the gradual weakening and bending of their long bones. But men who lay in a long drunk for a month, dull with opium and pleasured with drug dreams, would gradually weaken and become helpless without knowing what was happening to them.

This was the final revenge of Heracles, to turn these men into boneless horrors, men without skeletons, jelly fishes of humanity, helpless in their despairing terror—and they would not die! That was the beauty of it—that they would live on forever, like the Queen bee. In their system was food, concentrated and powerful, to keep them alive a thousand years, yet, what would such a life mean to them?

And Heracles, in his joy, visioned these helpless men in the Hall of the Dragons, hurled thousands of feet into the air. He saw them, living in a palace, cold and cheerless, with the damp of doom at noonday turned into a freezing, living death of cold, as soon as the weakened sun dropped behind the Western mountains. There they would live, perhaps worshipped and cared for as Gods by a few shivering mountaineers, perhaps neglected and forgotten, but, no matter what happened, they would never die. That was the beauty of it—the fact that they would keep on living. He was going to send them up, up, up in the air, so high that there would be no wolves to tear their boneless bodies and so cold that no flies would larvate in their helpless nostrils. Perhaps for a year or so he would visit them and talk over matters with them, or he might even induce the Emperor of Mo to come on an excursion and see for himself the fate that had come to those who plotted the destruction of Mo.

A Little Accident

SO, to the Bee-food and the opium and the hyoscine was added the juice of the internal glands of thousands of criminals and slaves. The entertainment began, and the Emperor of Gobi was happy in that he had such a wise physician and such a long life ahead of him, and such a fine ending to Mo, and such lovely women and such a skillful High Executioner, who could think of so many new and novel ways of killing men slowly. They laughed and loved and drank and stupidly thrilled over the men who died in front of them for their entertainment, not once realizing that their bones were slowly being dissolved within them, for each day Heracles increased the dose of the opium.

Across the Hall of the Dragons, Heracles had his seat of honor. He, only, of all those in the hall, could come and go, for the Emperor had given command that of all who came into the hall at the onset of the month, none should leave it till the golden button was pressed—that is, none except the dead slaves and those who killed them. And Heracles sat there, day after day, and he saw his enemies weaken from the disease, now known as *Osteomalacia*, but the servants and the Queens and those servants who were shapely enough to comfort the Emperor by serving as pillows for him and his Wise Men, these servants and dancing girls were spared the disease and simply lived on in a phantas-

magoria thinking that the growing incapacity of the Emperor and the other great men was simply the reaction, born of surfeit and drunkenness.

Then, on the twenty-eighth day, when Heracles knew that all of his plans were ready, he lessened the dose of the opium and thus allowed the drugged men to come to their senses, and, preparing food and wine in abundance, he left the Hall of the Dragons, and, cautioning the guards to let no one in or out, he retired to his palace, there to finish the destruction of the hated country.

When he had shut and barred and doublelocked the room in his Castle, wherein stood the table with the map of Gobi on it, he had left everything in readiness for the debacle. The tank was full of compressed air; from it a tube ran, divided finally in such a way that each of its four parts connected with the hollow of the telescopic legs. The joints of these legs had been carefully oiled with grease obtained by boiling the bodies of slaves. On the table was the finished map, perfect in every detail. A turn of the screw loosened the compressed air, the pressure of which would raise the map thirty feet into the air. As the map would rise, so would all of Gobi.

The secret of such scientific magic is now lost to mankind, but it can be guessed that Heracles possessed a knowledge of fluid pressures that has never been matched.

This much we know, that the pressure of the air in each of these little tubes, was, by his devices multiplied billion fold by a force under the surface of Gobi aided by powerful volcanic gases, so that when the table was lifted, the force of the gases under Gobi, proportionately great, lifted the country.

Heracles left all in readiness when he left. Now he came back.

He turned on the screw, and there was a hiss of air. Nothing happened.

For a very little and unexpected and unheard of something, even, had taken place during the twenty-eight days that the chamber had been tenantless. A little hungry mouse had wandered into the room, and for some reason had taken a fancy to the taste of the fiber tube, through which the air passed, and during many hours that mouse had eaten of the tube in many places, little holes, hardly to be seen, but large enough to prevent the tube from holding the air.

Heracles for all his wisdom had not been able to foresee this mouse. Now, with but two days at his command, the entire plan was ruined unless he could repair the tube. It was useless to try and make a new one. There was nothing else to do except to work, and this he did, tirelessly, systematically, persistently, repairing hole after hole. But, even with all his ability, the tube remained weak and not fully worthy of trust, and, finally, when the full pressure of air was turned into it, it still leaked so that it was not sufficient to raise the table. So, Heracles spent more precious hours, refilling the tank with compressed air, and then he did the only thing that he could do. He took part of the map off the table to lighten the load. Thus, all of the map, representing what is now Southern China and Burmah and the lower part of India, was taken off the table, and shared no part in the cataclysm that befell the rest of Gobi.

Then, finally, all was ready, yet, in this delay many valuable hours had been wasted, and Heracles stood there, swaying from fatigue and nervous tire and worry, and beneath his hand lay the screw that, turning, would destroy Gobi.

Yet, he waited.

And suddenly he heard a dull roar and then another and another, like a distant thunder storm, and he sickened, for he knew that he had waited too long.

There being nothing to do, he turned the screw and sent the full force of air into the legs of the table. It worked, and up went the map of Gobi into the air; but one leg was weaker than the rest; so, the table rose unevenly, and there was some sliding and slithering of the earth forming the map.

Heracles felt himself moving, slowly, as the palace he was in went up, because all of the land under it was in upward motion. It was a slow movement and hard to realize in that part of Gobi, for all of the land for thousands of square miles was going upward in perfect harmony. There was no way, in that part of the country to detect the movement save by the gradual increase in the coldness of the air.

The Boneless Horrors

HERACLES knew that his experiment had been a success.

Yet, from far away, there came the rolling thunder, and with a sickening sense of failure he knew that he had been a little late and that already Mo was sinking under the tormented waves of the Great Ocean.

Sighing, he put on heavy furs that he had prepared against this hour, and walked slowly through the deserted streets of the great city. Here and there a small house had fallen, but all of the royal palaces remained as they had been. For the most part the people, accustomed to a semi-tropical climate, were seeking warmth in their houses. Thus, the streets were deserted. On, the great Physician went, to the Royal Palace and on; to the Hall of the Dragons. There he found the guard on duty, but almost numb from the cold. With pity in his heart, he bade them seek warmth if they could find it. Then he went into the inner Hall of the Dragons, where he knew that, helpless, lay the Emperor of Gobi and his Seven Wise Men and his High Priest, and perhaps with them would be a few of the Queens, but of this he was in doubt.

While Heracles had been working in almost a frenzy to repair the air tube, the Emperor and his advisers had slowly regained their normal senses. Almost dazed, it was hard for them to realize what had happened to them, but of one thing they knew and that was the useless state of their bodies. for a

strange sense of helplessness overcame them, and all efforts to move but resulted in a peculiar writhing and a sad changing in their shape, with no progression.

The Emperor was no fool. While unable to know what had really happened to him, he had no difficulty in determining who was at the bottom of it. Only one man in all Gobi could work such a wonder as the dissolving of a man's bones in his body! He looked upward and saw that he was being supported on cushions, held by his favorite wife, and, not daring to speak, he made signs with his eyes that he should be lifted up a little. She did so, but slowly, for the sudden bending of that which had been his backbone caused fearful pains to shoot through him, which nearly killed him with the dreadful agony.

The woman wiped the sweat from his face, and he looked around him, and there on the divans he saw the men who had been his counselors, and they lay in odd shapes, like leather bags full of thin sausage, and on the faces of all of them was a Hell of despair, for that something had come over them, and they knew not what it was, save that they could not move and were growing cold, and realized that they could not die.

And, one by one, the women took the gold and the silver and the precious gems and fled from the accursed place, and only one remained. She held the head of the Emperor and tried to ease him of his pain, for she was his favorite wife and was going to bear him a son.

The Emperor tried to remember what it was all about and how he had come to this depth of trouble and then he recalled his bitter hate and knew that Mo still remained undestroyed, and he breathed harshly, and his woman knew that he desired to talk; so she put her pink shell near his mouth, and with a great effort he told her to press the golden button. This thing she did.

Thus, Mo was destroyed by the dainty fingers of a slave woman, who had no name and was simply there and faithful to the Emperor, while all others left him, because she loved him and was to bear him a son.

And in the room it grew colder, and the woman gathered the rugs and the silken sheets, and she wrapped each jelly fish of a man up as warmly as she could, but the warmest things she put around the Emperor. There the nine lay, boneless and unable to die, and the breath from their nostrils congealed like steam in the frosty air.

Thus, Heracles found them.

He sat down by the Emperor and told the story of what he had done and how he had planned that his enemies should live on for centuries, filled with the long life of the bee-jelly and boneless, because of the gland-juice that he had given. The Emperor heard it all, but was soundless and motionless, yet in his eyes was a look of hatred that only a great man can devise, and in his heart was a deep content, for he knew from the rolling thunder that Mo was being destroyed.

Meantime it grew colder.

The woman, shivering, feared for her unborn son. . . .

A Changed World

MO was being blown to pieces. The damage done by the thousands of tons of powder was only a small part of the harm done to that fair land. The buried gases, exploding, tore the deep rocks into a million fragments, and all over Mo volcanoes burst into activity. Tidal waves overflowed the land, lava buried it. Sixty million people were drowned, burned or suffocated with the poisonous fumes. A continent was destroyed, leaving scattered islands as small fragments—Borneo on one side and the Easter Islands on the other—Australia to the south was formed, arid, cheerless, a fit home for Bushmen. Some of the citizens of Mo survived on the mountain peaks, hurled upward, as in the Hawaiian group, but their culture, temples, wealth and even their tradition were hopelessly lost.

The Emperor of Mo, with his favorite wives and nobles, was feasting in their small city of refuge. The shock of the cataclysm reached them even in that far away rock-bound enclosure. They feasted on, each man and woman pretending to his neighbors at the banquet table that the sound was thunder.

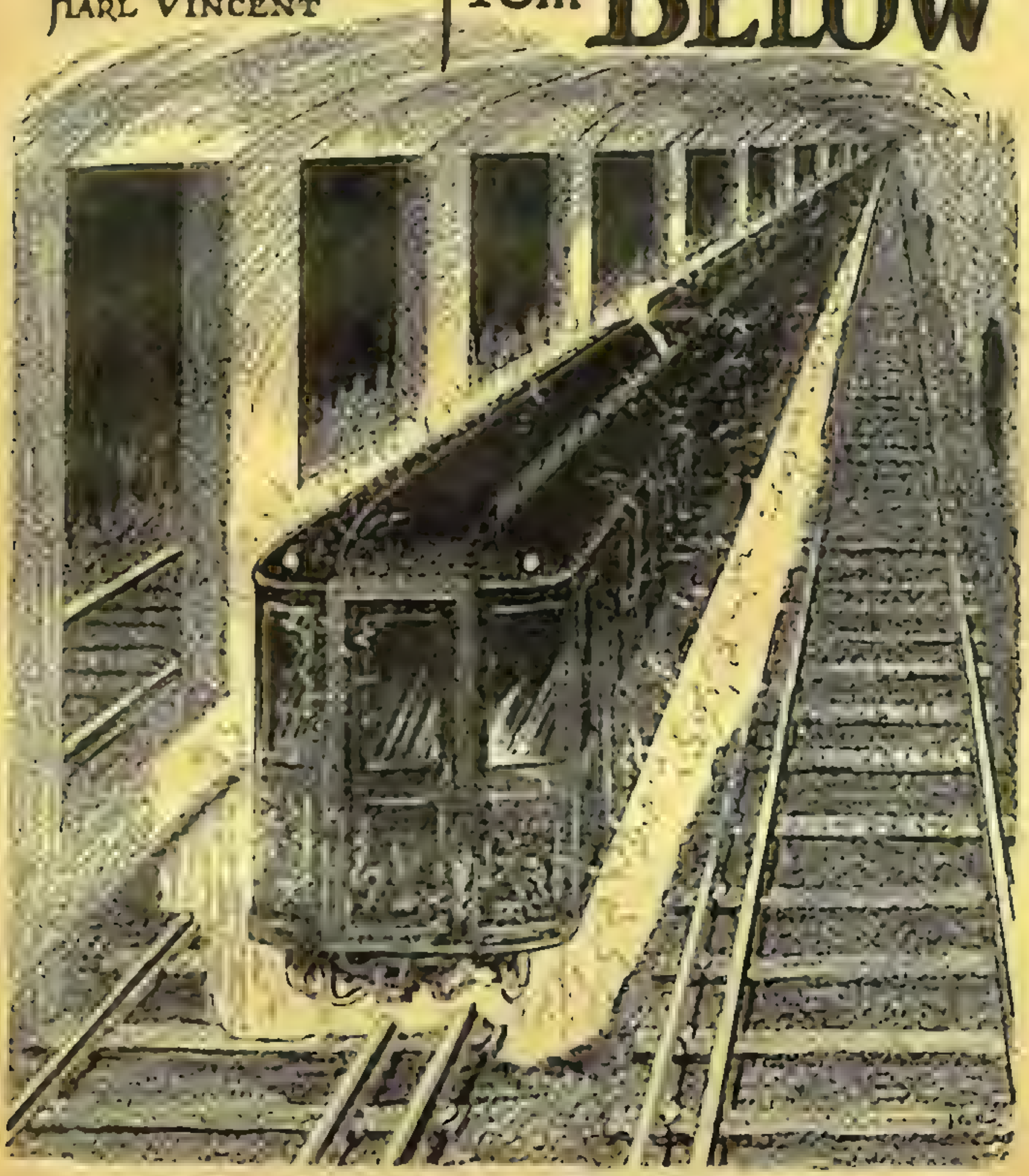
The banquet passed on through the night, and the next day a breathless messenger arrived with news that could only be given to the Emperor, and this news was whispered in the royal ear, as the great man sat at the head of the table. He, shivering, commanded a certain wine to be served and ordered in all seriousness that a health be drunk to their beloved land of Mo, and all of the great men and their lovely women drank of this wine and then sat down and died, and their servants fled in terror to press on into the desert, where they died in various ways.

Fourteen thousand years later three prospectors, typical desert rats of Arizona, prospected for gold near the Colorado River. One day, while working in a twenty-nine foot shaft, one of them drove his pick through the roof of what seemed to be an abandoned mine-shaft. It was paved with square, beveled stones, fastened together with cement. These stones had the appearance of great age. Descending into this shaft with torches, they followed it for twenty-eight miles and came to a buried city. There they found many old buildings, one of which was a circular chamber. In it was a large table of marble, around which sat the dead, dried bodies of seventy-two persons, all over six feet tall, with blue eyes, and white skin, and the flesh was white and firm, being preserved in some wonderful manner. On these dead bodies was wonderful jewelry, but most of the clothing had fallen into dust. In another large room were the dead bodies of over two hundred women who looked as though they were lovely in their day, and this place the desert rats thought might have been a harem. Throughout the city there were peculiar trap doors and all kinds of

(*Continued on page* 180)

The Menace from BELOW

by HARL VINCENT



The roof and bottom wall of the tube glowed brilliantly. The bottom seemed to drop from the tunnel, leaving a huge transparent space. The train remained seemingly poised in mid-air.

CHAPTER I

A Strange Disappearance

"WELL I'll be dog-goned!" exclaimed Ward Platt as he unfolded his morning paper and read the screaming headlines that topped the first page.

He stared across the breakfast table at his wife, who was pouring his coffee. "Have you seen this, Mary?" he asked.

"No, dear," she replied, "I haven't looked at the paper. What is it?"

"Just listen to this," he said. "Either it is the greatest hoax ever attempted or it is the most mysterious happening that has ever been reported."

The headlines and the sensational news item that so astonished Ward Platt on that memorable morning in the Spring of 1935 startled the entire civilized world and were forerunners of a series of amazing events in which Platt later became deeply involved. His wife listened in open-mouthed astonishment as he read the unbelievable news:

WEST SIDE SUBWAY EXPRESS TRAIN VANISHES
TEN CAR TRAIN LOST IN EAST RIVER TUNNEL
MORE THAN 500 PASSENGERS WERE ON BOARD

"At 12:35 A. M., it is reported, an Interborough express train, bound for Van Cortlandt Park, left Clark Street station, Brooklyn, and has not been seen since. The train did not appear at Chambers Street when due and, when the train scheduled to follow it pulled into that station, an investigation was started by officials of the Transit Company. Late riders, who waited in Wall Street station of the west side line for an unduly long period, report that the train did not pass through, so it is clearly evident that the missing train disappeared in the tube which passes under the East River between Clark and Wall Street stations. All cars and trains have been checked in and out of the various terminals and despatching stations, but the ten cars that comprised the strangely missing train can not be located.

"Just before going to press, this newspaper learned that a complete survey of the tunnel has been made and that there is no trace of the vanished train, nor are there any indications of the possible manner in which it disappeared. The tracks are intact throughout the length of the tunnel, as are the walls of the tube. It is estimated by officials of the Interborough Rapid Transit Company that no less than five hundred riders occupied the train and this is considered to be a very conservative estimate. The police are completely mystified."

HARL VINCENT

At this point Ward Platt looked up from his reading and gazed disbelievingly into the puzzled eyes of his wife. "Why, Mary," he ejaculated, "this is ridiculous. The thing isn't possible. How on earth can we be expected to believe such a yarn? How could a train of ten heavy cars, composed mainly of iron and steel, make its way through a solidly joined and concrete-lined tube of heavy cast iron that is buried deep in the mud and rock bottom of the river? The tube is of the same size throughout—there are but two lines of track, no sidings nor spurs—not a recess in which a man could hide, let alone so massive a thing as a complete train of cars loaded with passengers. It must be a hoax."

"It is scarcely credible," said his wife, "little as I know about such things, it does not seem reasonable to me. But the *Times* is a very conservative paper and it hardly seems likely they would publish such a story unless it had a pretty strong foundation of fact."

The newspaper article continued with a rambling, reportorial fantasy propounding highly imaginative and impossible solutions of the unprecedented happening. Suddenly Mary Platt thought of the radio and she snapped the switch. The agitated voice of a news announcer filled the room immediately.

"More than two hundred persons have telephoned the police and reported loved ones missing," spoke the voice of the announcer. "The offices of the Transit Company are besieged by other hundreds who are looking for news of relatives and friends who were known to have been returning from Brooklyn to their homes in Manhattan or the Bronx at about the hour at which the train is said to have disappeared. The subway stations are packed with curious people and consternation is evident among those riders who find it necessary to board trains that must traverse the tunnel. Many are refusing to make the trip and are crowding the bridges, some using the surface cars but thousands crossing on foot. The police are finding considerable difficulty in limiting the bridge traffic to a safe volume.

"Each train that en-

OUR well-known author may always be relied upon to do the unusual. The present story is easily one of the most extraordinary science fiction stories that we have read in a long time.

It is just chock-full of fourth dimension, as well as atomic energy. Incidentally, the story rings with exciting adventure and hair-raising incidents, many of them will fairly take your breath away. The story is so absorbing, that after you have calmed down sufficiently, you will lay it aside with the mental reservation to re-read it once more at your leisure.

ters the tube is manned by twenty police officers, two to a car. The passengers are few and these are mostly people who consider the entire thing as a joke. But it is now clear that it is no joke but a terrible reality. Every effort of the Interborough detectives has failed of locating the missing train, whose car numbers are on record and definitely known to be missing. A number of persons who have been questioned by the police report waits at various points along the west side subway line to keep appointments with friends or relatives who must have taken a train at about the time scheduled for the missing one. All evidence points to the truth of the report and it appears that New York City must face a disaster that is of considerable magnitude and is, so far, absolutely unexplainable."

"Experts are now engaged in a minute examination of the tracks and of the tunnel itself to determine whether there are any traces whatsoever of the missing train and its occupants. No logical solution of the mystery has been advanced, though superstitious folk are hinting of ghostly visitations and all sorts of necromancy and witchcraft."

"It seems that there is something in it," said Mary Platt with a worried look at her husband, "are you going down town?"

"Indeed I am," he responded, "I'll be called in on this thing, you know."

"You're not going to take the subway, are you?" This in an extremely anxious voice from the pretty woman who faced the great engineer across the table of the cozy breakfast nook in their Riverside Drive apartment.

"Of course I am, dear," laughed her husband, "but only as far as Times Square. I'm going directly to the office."

"Please don't cross to Brooklyn," entreated his wife, "at least until more has been learned of this terrible thing."

"Don't worry now, dear," he said, arising from the table and preparing to leave, "I may have to get into the affair in detail but I shall take every precaution."

But it was an extremely anxious little woman who waved to him a few minutes later as he swung down the Drive toward Seventy-second Street where she knew he would board a down-town express.

A Job For Magicians

WARD PLATT did some heavy thinking as he neared the kiosk at Seventy-second and Broadway. The firm of Platt and Frazee, of which he was senior partner, had won an enviable reputation as the greatest organization of Consulting Engineers in the country and Ward Platt himself was considered as the most able man in his line. The firm had prospered greatly and its widespread activities increased steadily in scope and magnitude, whether times were good or bad. Of late years their services had been in constant demand, not only by private corporations but by several states and municipalities. In New York they were compelled to establish a special department to handle municipal work, of which a considerable amount was obtained from the Department of Public Works. The services of the concern were likewise in great demand by the Transit Commission and it was for this reason that Platt felt certain he would be called in on this weird problem which had so suddenly confronted the great metropolitan district.

He elbowed his way through a milling, gesticulating crowd at the subway entrance and made his way through the turnstile and down the stairs to the platform with some little difficulty. The crowd was oddly divided in opinion as to the strange happening of the night before. Some were frankly incredulous; others manifested their belief in almost anything that might have happened; all were more or less fearful of riding the trains. He found no trouble in obtaining a seat when he finally boarded a train, though he would ordinarily have been compelled to stand on a crowded platform since it was time of the regular morning rush.

When he reached his offices in the new Forty-second Street Building he found his force gathered in excited groups with a great proportion of their number not yet arrived. His partner, Charles Frazee, hustled him into a conference room where sat Mayor Hamlin and two members of the Transit Commission.

"Good morning, gentlemen," said Ward Platt, removing his hat and top-coat, "I presume you are here so early on account of the reported loss of a subway train."

"Yes, Ward," said the mayor, "and something's got to be done about it."

Ward laughed. "That's a pretty big order," he said, "if there's anything in these reports."

"They're absolutely true," stated the mayor, "three persons have informed the police that they accompanied friends to the very train and watched it pull out of Clark Street station. The friends have never been heard from since, nor have any of more than three hundred other possible passengers on whom information has been obtained."

"Well, it is certainly a most mysterious occurrence," said Ward, "but what can you want us to do?"

"I know it is a little out of your line—more like scientific detective work," said the mayor, "but I don't know anyone more capable of getting to the bottom of the matter than you and Charlie. It is a cinch that this trainload of people did not evaporate, but it is just as certain that it has disappeared as utterly as if dissolved into the air by some trick of the black art. But we all know that there is a logical explanation and that it can be found if proper effort is made. We want you to undertake the task."

Ward Platt looked at his partner. "Well, what do you think of it, Charlie?" he asked.

"I haven't the least idea what to look for," replied young Frazee, "but we can try it."

"All right," said Ward, "we'll try."

The mayor grasped his hand. "Thanks, Ward."

he said, "I feel better already with you on the job. There's the devil to pay about this, you know, and it's going to be worse when the casualty lists are complete. The Police Commissioner will be instructed to furnish all assistance you may require from his men, and the City Engineers will supply anything in the way of material you may need."

"It seems to me," said Charles Frazee, "that we should have an Arthur Conan Doyle or a Houdini on this job rather than engineers and scientists and policemen. But we'll tackle it."

When the mayor's party had gone, Ward faced his partner with a serious expression on his usually cheerful face. "Charlie," he said solemnly, "this is the toughest job we ever tackled. And I can't for the life of me see how we are going to get anywhere. A careful inspection has been made of the tunnel without results and we are not magicians, you know."

"It's a tough one, all right," agreed the younger man, "but darn it all, Ward, it's got to be solvable. That train was taken from the tracks and spirited away under the river by some outside agency and it must have been by physical means."

"But who in the world would want to do such a thing, even if it were feasible?" queried the senior partner, "granting that it was done by some as yet unexplained human agency, what could be the possible motive?"

"It's beyond me, Ward, but it was done somehow and it's up to us to learn how. Have you anything in mind?"

"Nothing definite. But I think we should first make a trip through the tube and see if we can get any ideas. That is the first step, to my way of thinking, and we don't want any police officers or detectives along either."

"Right," agreed Charlie, "let's go."

CHAPTER II

More Happenings

AT another point, not far from New York, the preceding night had brought strange happenings. At three in the morning, Anthony Russell lay awake in his bed, listening to the dreary patter of the rain on the tin porch roof outside his open window. He had retired early but he could not sleep, so, after courting slumber for a number of hours without success, he arose and, donning bathrobe and slippers, lighted a cigarette. He was restless and soon tossed aside the book he had started to read.

Tony, as he was called by his intimate friends, had been working too hard for many weeks and it was beginning to tell on him. His sleeplessness this night was nothing new. For the past week or more he had scarcely slept a night through and finally, in desperation, he took the advice of his dear friend, Doctor Vance, and fled to the country for a week of rest.

So here he was, in a gloomy old house on the outskirts of Cartersville, two hours by subway and fast train from his office in Wall Street. And now, the very first night, his insomnia reasserted itself. Impatiently he stepped to the window and observed that the rain was becoming a mere misty drizzle. He decided to dress and venture outside. Anything was better than sitting until daylight in this high-ceilinged, old-fashioned room, with its flowered wall paper and sedate air of the "spare bed-room."

With hat pulled down to his ears and with rubber coat over his arm, he tip-toed down the stairs to the front door. Quietly, so as not to awaken the household, he drew the bolts and stepped out into the dank night air. The rain had now ceased entirely, but he shivered with the chill of the mist which hung low over the lawn, almost obscuring from view the lone street lamp on the corner.

He was unfamiliar with his surroundings, but proceeded up the street in a leisurely manner as he drew on his coat and buttoned the collar tightly about his neck. A block away, he remembered from observations made on his arrival the preceding evening, this street crossed a broad, concreted highway which was evidently quite new. He soon reached this and, turning to the right at the corner, started for the open country without thought as to how long he might prolong this nocturnal walk.

His mind was ever on his growing business in the city and, even now, he was thinking over the reorganization plans he had left uncompleted when good old "Doc" Vance hustled him out to Cartersville.

"Like most of you modern business men," the doctor had said, "you are killing yourself in your mad rush to make money. You must let up, Tony, or you will have a complete breakdown. And a fine thing that would be at your age. Why man, you're only thirty-two, and the best years of your life are still before you. Let your partner take care of things for a while and go up to the old Vance place in Connecticut for a rest. The old folks will take good care of you and I will come up myself for a week-end while you are there. It will do you worlds of good and we can have a pleasant two-day visit besides."

Tony argued and procrastinated but finally, with very poor grace, gave in to his friend's urgings.

But he found it difficult even now to rid his mind of business problems. It was not until he heard the sound of a rapidly approaching automobile that his thoughts turned into other channels. The road ahead was suddenly illuminated by the bright headlights of a speeding car and he stepped to the side of the road. As he looked back he was momentarily blinded by the intense glare and he nearly tumbled into the ditch as a powerful roadster shot past with a roar that spoke of speed limits broken, twice over.

"Whew!" he exclaimed, as he scrambled back to the slippery concrete, "that fellow's in a hurry. Wonder where he's rushing to at this hour of the morning."

The mist had been almost dispersed by a freshly sprung-up breeze and he watched the beam of light

that marked the car as it disappeared rapidly in the distance.

About two miles further on he stumbled into the spare tire carrier of an automobile parked at the side of the road. The head and tail lights had been extinguished, but he noted by the dim radiance of a small parking light that the car was a roadster of foreign make and of rakish lines that suggested power and speed.

"Must be the car that passed me," he muttered. And when he touched the radiator and found it very hot he felt certain that this was the case.

While he pondered over the probable reasons for such a late and hurried visit to an apparently deserted spot, he became aware of voices a little distance off the road. They were raised in anger and his curiosity was at once aroused. But the darkness was intense and he could make out nothing in the direction from which they came.

"I tell you Bob, this is the end!" spoke one of the voices, shouting in anger.

With that, a square of light appeared about fifty feet from the road. This revealed itself as the lighted window of a second-story room. Tony watched for a moment and saw the two occupants of the room, one a tall man fully dressed, the other a short, heavy-set man in pyjamas who had evidently just been awakened by his late caller. The portly one walked to the window and closed it, with the obvious intention of shutting the sound of their voices from the outside world. He seemed to be highly agitated and shook his fist in his caller's face before drawing the shade.

A light showed in the adjoining window and the same stout figure approached this one. His caller had not followed, as far as Tony could see, but the man in pyjamas reached up to close this window as he had the first. With arms above his head, he seemed to gasp for air and then double up as if in pain. His hands came down without having touched the window and clutched wildly at his breast. His broad figure wilted and collapsed without a sound.

Tony hesitated, not knowing what to do, and in that instant the heavily-coated stranger stepped into the field of vision and bent over the body which had now slumped out of view below the window sill. For a moment the tall man remained in this position, then he stood erect and completed the task started by the other. He closed the window and hastily drew the shade.

Vanished!

FEELING certain that something out of the ordinary, probably a tragedy, had occurred, Tony felt his way along the hedge that enclosed the grounds until he found an opening, through which he made his way and reached a gravel walk. There was not a sound from the house, which he could barely make out as a large, forbidding structure of Colonial design. With his heart in his throat he moved as noiselessly as possible, still feeling his way along the hedge, which also bordered the walk. His feet eventually encountered the steps of the porch and he tip-toed up, expecting to hear a creak at every move.

When he was half way to the door, the porch was suddenly flooded with light from within and, simultaneously with its appearance, there was a shrill feminine shriek. The door opened precipitately and the tall stranger rushed out, knocking Tony off balance in his dash for the road.

On the floor boards of the porch, still slippery from the rain, Tony lost his footing and fell heavily. By the time he picked himself up he heard the roar of a starting motor and the high-powered roadster was literally jerked into motion and away. Before he could even collect his scattered wits the lights had vanished around a bend in the road.

He turned to the still open door and was astonished to see a crumpled figure at the foot of a winding stair that led upward from the spacious foyer within. Seeing that this was a woman in a dressing gown, he hastily stepped in. The figure lay in a heap, face down, a mass of tumbled golden hair spread over the head and shoulders like a glistening mantle. Carefully he turned the limp body over and saw that it was that of a beautiful girl, hardly out of her teens. A sigh from her told him this was only a faint and he experienced an immediate feeling of relief.

The girl opened her eyes and gazed at him, horror-stricken. Then she sat up suddenly and blinked as if to clear her vision.

"Who—who are you?" she asked fearfully.

"I am Anthony Russell," replied Tony hastily, "don't be alarmed. I was passing and saw strange happenings in the house, so I came in. Can I help you?"

He assisted the girl to her feet and she leaned against him a moment for support, then burst into wild sobbing.

"Oh, oh!" she wailed, "poor father! He's been killed. And Bob was here—they'll get him! What shall I do?"

"Who is Bob? And did he kill him?" asked Tony excitedly.

"No! No!" answered the girl hysterically, "I know nothing. I was asleep. The voices awoke me and I came to the head of the stairs. I saw—I saw—"

She bit her lip and the great brown eyes widened in horror. Gazing pleadingly at Tony, she pulled her dressing gown tightly about her slim body and started slowly up the stairs.

"But can't I do anything, Miss?" he asked, in agitation, "surely you're not alone in this house with your father's body, and with a murderer escaping at the moment? There may be accomplices about."

She turned toward him and again started sobbing. Leaning on the stair rail to steady herself, she said, "Yes, you can help. And please excuse my rudeness. But it is all so horrible I can't think—can't reason yet."

"Where are the servants?" he asked.

"There are but two and this is their night off.

But please don't ask me any more questions now."

Something altered the girl's expression. A look of horror and fear suddenly hardened into stern resolve as she tottered and seemed about to faint once more.

Tony assisted her to a settee in the second floor hall.

"Now, you stay right here," he said in a tone of authority, "and I'll go in and see if something can be done for your father. He may not be dead after all."

"Oh no," she said hopelessly, "he's dead. I'm sure he is. But you can satisfy yourself if you wish. Through that door on the right."

Advancing into the room where lay the body, Tony felt the chill of death in the air. But he knelt beside the huddled form and felt for the pulse of the victim. Obviously the body had been untouched, since it was still crumpled in a grotesque heap beneath the window sill. With a shudder of distaste he straightened the twisted limbs and stretched the body to a prone position, observing as he did so that there were no signs of blood about the person of the pyjamaed man. He searched vainly and was unable to locate a wound of any sort whatsoever that might account for the man's sudden demise.

But he was dead—there was no doubt of that. Tony convinced himself of this at once and then sprang to his feet in sudden recollection. There had been no sound of a shot! He distinctly recalled his surprise at seeing the figure collapse so unexpectedly. And here was a body without a wound. It had flashed across his mind at the time that this must be a stroke of some kind brought about by the man's evident anger. How then had this man been killed?

And it was stranger still that the victim should be old Van Alstyne. Tony recognized him at once as the cold-blooded financier who had, within the past week, increased his already tremendous wealth by some eighty millions in one of the most spectacular big business mergers of the decade. And the papers were still reviling him, still darkly hinting of political intrigue, of the illegality of some of his operations, of widows robbed of their savings to swell his own coffers. Quite probably the theory of the stroke was the correct one after all, he thought.

At the sound of the girl's voice from the doorway Tony turned abruptly from his contemplation of the body. So this was Margaret Van Alstyne, debutante daughter of the great man.

"He's dead?" she asked in a whisper.

"Yes, I'm afraid he is. But it may be that he died a natural death. He has no wounds. We must call the police."

"No! not that!" the girl almost shrieked, "call Doctor Joyce. But not the police—yet. Please say you won't."

Tony looked his amazement. Her agitation was undoubtedly extreme. Surely this sweet girl had not murdered her own father, he thought. Surely this Bob she had spoken of was not her lover and had killed the old man in the argument he had witnessed. But he put these thoughts from his mind at once. They were too absurd to be considered.

"All right, Miss," he agreed, "we'll call the doctor."

Her eyes widened in terror as he spoke. Her face blanched and she stretched forth a shaking forefinger that pointed past him toward the body. With a scream that echoed through the empty house like the despairing cry of a lost soul she slumped to the floor in another swoon. Tony hastily turned in the direction she had pointed. Van Alstyne's body had disappeared! But the pyjamas lay in a crumpled pile, still outlining the figure of the corpse in the position it had lain. It was as if the body had dissolved into thin air, leaving its covering behind—empty.

"Well, I'm damned!" he exclaimed in amazement. Then he turned once more to the girl to start the work of restoring her. No wonder she had fainted!

CHAPTER III

Comparing Notes

AS Ward Platt and Charlie Frazee discussed the problem which had been turned over to them by the mayor there was a ring at the telephone in the conference room they occupied. Ward answered the ring and then passed the telephone instrument to his partner.

"Long distance for you, Charlie," he said.

"Hello! Yes, this is Mr. Frazee speaking," Charlie repeated mechanically into the transmitter, "oh—hello, Tony. Glad to hear from you. What's that? Van Alstyne's dead? His body vanished?"

Ward Platt sat forward, startled into close attention as his partner listened closely to the words spoken so rapidly at the other end of the wire. An occasional interruption by his partner gave him a fairly good inkling of the drift of the conversation and his mind instantly associated this new development with the strange happening in the subway. When Charlie eventually hung up the receiver he turned to his partner with amazement written all over his features.

"That was Tony Russell," he said, "he's up in Cartersville at old Van Alstyne's country home. Happened to be passing by and saw the old man apparently killed. Rushed into the house and found him dead but with no wounds. Margaret, the daughter, you know, was there and suspected someone of the murder but Tony could find no evidence that he had been murdered. No bullet or knife wounds. Then, while he was talking with the girl the body vanished from before their very eyes. The girl's gone, too, now and Tony's nearly bughouse. Evidently fell for her. I told him to hurry down here, as you overheard. But, isn't it the darnedest thing you ever heard of—next to the subway mystery?"

"Yes. And I can't help tying the two events together somehow."

"Me too. These sure are queer doings."

Four hours later the two engineers returned to their office, more completely mystified than ever. They had examined every foot of the tunnel from which the train had vanished and were unable to find the slightest evidence upon which a theory could be based. It was an impasse that stumped them and left them at their wits' ends. A feeling of relief came to the two men when they were advised that Anthony Russell awaited their return. Here at least was a new angle to the mystery—something else to discuss and puzzle over.

Tony and Charlie greeted each other effusively. They were fraternity brothers and had been closely associated during their college years.

Ward Platt took an instant liking to the young man who was the friend of his partner. "What is your business, Mr. Russell?" he asked, after the formality of the introduction was over.

"Tony's an inventor," laughed Charlie, before his friend could reply, "but one of those rare specimens with a head for business along with the genius. He's president of the Russell Television Corporation."

"Fine. Fine," said Ward, "I must congratulate you on the wonderful work that has been done by your outfit. Maybe you can help us in the job we have before us. Have you heard about the mysteriously missing subway train?"

"Just read about it on the way down," replied Tony, "are the newspaper accounts true?"

"They are," said Ward solemnly, "and it is a strange parallel to the case of old Van Alstyne's body."

"Yes," replied Tony, "I was struck with that idea as soon as I read of the tunnel mystery. What on earth can it mean?"

"That's what Hamlin has commissioned Charlie and me to find out," said Ward dryly, "but, suppose we discuss it at lunch. It is way past the hour."

The three men were soon on the street and on their way to the Astor afoot. They chatted lightly as they elbowed through the crowds that packed the vicinity of Times Square. The mystery of the subway tunnel was on every tongue and they found no little amusement at some of the remarks of the excited passersby. The congestion of traffic was terrific and, as they crossed Broadway and turned northward alongside the Times Building, they found great difficulty in progressing toward their destination. There was a startled exclamation from Tony and he attempted to make his way from his companions in the direction of someone he had seen in the crowd.

"Margaret Van Alstyne!" he repeated, when questioned by Charlie, "there, up ahead. She's about to enter the subway kiosk."

He struggled and pushed to force his way in the direction pointed out and, by dint of much tussling with exasperated and complaining pedestrians, finally managed to reach the entrance through which the girl had disappeared. Down the stairs he clattered and it was several minutes before Ward and Charlie were able to follow.

When they did reach the stairway Tony was not in sight so they decided to wait for his return.

"Guess he's gone on the girl all right," commented Charlie, "and looked scared to death. Did you notice her?"

"No," answered Ward, "she was too quick for me. And I hope too quick for Tony. If he becomes involved in a wild goose chase after this young woman, we may not be able to use him in the task that confronts us. I have an idea he may be of great assistance if we can keep him put on the job."

"No doubt of that," agreed Charlie, "the boy has a wonderful brain and has had a raft of experience in all sorts of research. He was the shining light in the physical lab at college and has dabbled a whole lot in pure science ever since. It's a hobby with him and he is smart enough not to let it interfere with his success in business. But here he comes—alone."

Joining Forces

IT was a disconsolate Tony who greeted them at the turnstile through which they had not passed. He was out of breath from his efforts in attempting to overtake the girl.

"Missed her," he said gloomily, "she ran for a down-town express and I just reached it in time to have the doors close in my face."

"Never mind, old man," said Charlie, "she's probably on her way to visit relatives until she gets over the shock of her father's passing. I shouldn't worry if I were you."

"That's right, Mr. Russell," chimed in the cheery voice of Ward Platt, "you'll find her later. Come on now—let's eat."

Ten minutes later, in the comparative quiet of the Astor grill room, the three men continued the discussion of the strange events of the past night.

"So you think there is some connection between the Van Alstyne case and the disappearance of the subway train?" asked Tony.

"Yes I do," replied Ward, "though I have no real reason, other than that both cases are similarly baffling and unprecedented. You say that Miss Van Alstyne left the house shortly after the discovery that her father's body had vanished?"

"Yes," said Tony, "after she recovered from her swoon, I called the local police and they arrived on the scene before dawn. They questioned us and Miss Van Alstyne seemed ill at ease when the name of her brother was brought up. It seems that this nocturnal visitor in the high powered car was young Bob Van Alstyne and it was quite evident that she feared he was involved in the crime. Of course she wanted to protect him because, from what I learned up there, she is unduly fond of this worthless brother of hers. It developed that his argument with the old man was brought about by a demand for more funds to carry him on his down-

ward path among the gamblers and gangsters of the white-light district. But I am sure the girl was mystified as were the police, and, of course, they could not hold her, since there is no evidence that her father was actually killed. The corpus delicti not being producible, you know."

"There were no sounds in the room when the body vanished?" asked Ward.

"Not a sound, and, though my back was turned to the corpse, Miss Van Alstyne swore she heard none and that she saw nothing except a sudden deflation of the corpse-filled pyjamas which appeared to slump to the floor in a sort of a mist that left the clothing empty when it cleared."

"Sounds like witchcraft," laughed Charlie.

"Not more so than the subway incident," said Ward, "and one can not blame the man on the street for suspecting something of the sort. Both occurrences are uncanny, to say the least, but I have a feeling that the solution of one will lead to the solution of the other."

"How do you expect me to assist?" asked Tony.

"My idea is this," was Ward's reply, "your company must have in stock a considerable number of television transmitters and receivers of the latest type and, if so, it is my thought that we might equip every train that enters the tunnel with one of the transmitters so that any further happening can be watched from a distance. Undoubtedly there will be repetitions of the incident."

"You think so?" asked Tony with great concern.

"I do."

"Well, we have plenty of television instruments out at the factory in Long Island City and I can put a force of men at work on a moment's notice installing them wherever they may be needed."

"Good," said Ward, "then, when we return to my office, I'll get in touch with the proper authorities at once and arrange for their installation on a number of trains to be sent through the tube. It may take days of watching, but I am confident we shall learn something by this means."

"But," objected Charlie, "suppose the perpetrator of these outrages strikes at some other point next time? If the same hand that wiped the train out of existence accounted for Van Alstyne as well, there is no reason to suppose it can not strike at any desired point."

"A reasonable supposition, Charlie. But somehow I feel there is something big behind this and that the thing is being accomplished by scientific means that have been in the course of development for years. I think that a definite program is planned by someone who has erected mechanisms of some sort at a number of points where they may be operated to accomplish the desired results. But I do not feel that the train was wiped out of existence. I think that it was stolen intact and that its occupants are still alive, though they may be in grave danger. The apparatus, whatever its nature, that was involved in the removing of that train from the tube must be of great power and tremendous cost and can hardly have been duplicated at other points. Possibly there may be individual cases at other points similar to that of Van Alstyne but, as far as the wholesale kidnapping of a trainload of people is concerned, I hardly think we may look for its duplication at other localities."

The Third Blow

THE subject was discussed for a full hour during and after lunch and the three men returned to the office of the engineers with a well-formed plan in mind.

When they arrived Ward Platt was informed that the mayor had been trying to get him by telephone for more than three quarters of an hour and that he seemed most anxious to get in touch with him.

"Something's happened already," said Ward, "as sure as you are a foot high."

He called the mayor's office immediately and was soon conversing with that official.

A few minutes later he replaced the receiver carefully and faced his companions with a set expression of determination in his gray eyes and in the angle of his chin.

"You got most of it?" he asked.

"There was another?" asked Tony.

"Yes, an eight car express lost in the same spot. Just as I predicted."

"What time did it happen?" asked Charlie.

"While we were at lunch. The train left Times Square at 2:10 and was reported out of Chambers Street at 2:29. They're not running them very fast you know. And it is being kept out of the papers for the present."

Tony jumped to his feet and his face took on a ghastly expression of fear. "Two-ten from Times Square, did you say?" he intoned in a fear-deadened voice, "good God, fellows! Margaret Van Alstyne was on that train. I looked at my watch as it pulled out of the station."

CHAPTER IV

On The Trail

ANTHONY RUSSELL labored incessantly all through that night and he drove his force of installation engineers unmercifully. By morning there had been completed the installation of television and radio transmitters and receivers on eighteen trains of the West Side subway and, in addition, six complete outfits were installed in the tunnel itself. These were distributed at equally spaced points of vantage and were of the remote-control type so that no operators were required to keep them in service. A central observation and control apparatus was erected in the director's room of his Wall Street office and here it was possible to view simultaneously the images transmitted from the various instruments installed in the tunnel and trains.

The news of the disappearance of the second train leaked out through the efforts of an overzealous reporter of one of the tabloid newspapers

and the metropolitan district was in an uproar. Although both accidents had occurred in the tunnel of the West Side line of the Interborough, it was practically impossible to convince the public that it was safe to ride through any of the other tunnels. When the early morning rush hour commenced, the ferries over the north river were crowded to capacity. The new Hudson River bridge carried an increasingly heavy traffic and the bridges over the East River groaned beneath their unaccustomed loads. Regular train service was maintained in the Hudson tubes but the travelers were few and far between. Traffic on all lines of the Interborough, B. M. T. and the new Eighth Avenue subway was normal in Manhattan, but trains were not continued below Wall Street nor across the East River excepting on those lines which crossed the bridges. On the Brooklyn side, Borough Hall station became the terminal for the Interborough lines and traffic through the tunnel of disaster was limited to two trains in each direction, which were to ply back and forth between Wall Street and Borough Hall, each manned by a company of National Guard and a detail of police. The television radio equipment on these trains and in the tunnel was placed in operation at an early hour.

Tony insisted on riding the first train that entered the tunnel and Charlie Frazee accompanied him. Ward Platt, with the mayor and other city officials, occupied the room of the many television screens and watched with interest the manipulations of the operators of the Russell Television Corporation as they made the adjustments that brought into view on six separate screens the images from the stationary transmitters in the tunnel. Then contact was obtained with the instruments on the four trains to be shuttled through the tube. The entire interior of the forward car of each train was pictured in its individual screen and a second transmitter on the forward end of the car recorded a view of the tunnel ahead. There were thus fourteen screens in operation at the central viewing station, with the result that the scene was thoroughly covered.

As the first train pulled out of the station, Ward Platt watched the screen picturing the interior of the first car. Here were visible the tense faces of Tony and Charlie, behind whom were gathered a group of police and militia, all straining to obtain a view of the tracks and tunnel ahead. The radio loudspeaker was connected to the receiver tuned to the instrument on this train and Ward spoke into the microphone, bidding his partner good luck.

Charlie smiled and returned the greeting. "Don't worry about us, Ward," he said, "We'll come through all right and we're going to see this thing to a finish. But Tony's worried about the lady."

Tony grinned somewhat sheepishly at this. "Frankly I am, Mr. Platt," he said, "I know she was on the last train lost and have a premonition that she did not leave the train in Manhattan. If that is the case, she is lost with the rest of the passengers."

"But you have no certain knowledge of that," said Ward, "She might have left the train at Fourteenth or Chambers or any of the stations on the way down. She is probably safe somewhere in Manhattan at the present moment."

But Tony shook his head gloomily at this. He was not to be convinced.

The Hunters Caught

THE train was gathering speed and the watchers at the screens transferred their gaze to the view of the tunnel ahead of it. It seemed that they were riding the front of the train themselves, so realistically were the onrushing tracks and tunnel walls portrayed. When the lowest point was reached, or about half way through the tube, a sudden flare of red light appeared in the space between the tracks and only about a hundred feet ahead. Through the loudspeaker came the screaming of the brakes as they were applied with full pressure. A quick glance to the other screen showed the occupants of the front car thrown into struggling heaps by the sudden jar, and yells of surprise and pain mingled with the jarring clatter of the stopping train.

"Looks like we're in for it!" shouted Charlie, picking himself to his feet and staring from the front window of the car.

The gaze of the watchers in Russell's office shifted once more to the forward screen and there they observed the sudden changing color of the warning light. It flared high, changing slowly from its brilliant red to a pale violet glow that seemed to creep along the track toward the ill-fated train. Then one of the operators uttered a startled cry.

"Look!" he said, pointing a shaky finger to another of the screens.

This one received the image from one of the permanent transmitters in the tunnel and it pictured the train itself from the rear. The violet haze had surrounded the metal-work of the cars and from every corner and angle there glowed sparkling pinpoints of light that sputtered and blinded the watchers like miniature explosions of flash powder.

The tracks and bottom wall of the tube glowed brilliantly with the same eerie light and suddenly they vanished from view. The bottom seemed to have dropped from the tunnel, leaving a huge brightly lighted space beneath. But the train remained intact, seemingly poised in mid-air. Then, slowly, surely it was lowered into the great opening, apparently dropped by hydraulic jacks or other deliberate means. Before they could exclaim their astonishment the normal light of the tube was restored and to their amazed eyes the tracks and tunnel floor were in their original solid and uninterrupted condition.

A shout came from the loudspeaker and the watchers turned to the other screens. Inside the car could be seen Charlie and Tony, their faces frozen in unnatural grimaces. Behind them there appeared the rigid forms of a number of soldiers and police, all frozen to immobility and seemingly unable to move a muscle. Tony grew red in the face in an ineffectual attempt to speak. His fea-

tures contorted painfully but he was unable to utter a word. Then came the sound of shouting from outside the car, and the watchers turned to the outside viewing screen.

The view pictured an immense cavern, crowded with creatures, at first sight of which, the mayor uttered an involuntary cry of disgust and fear. Monstrous apes, they seemed to be. But those in closest proximity faced the watchers with evilly leering human countenances. Then these were thrust aside unceremoniously by a man who approached the train with extreme anger in his glittering eyes and with shouts of impatience to his inhuman companions.

"Curse them!" he yelled, "They've got a television instrument on this car."

His glowering face loomed large in the screen. A large iron bar was raised and, just as Ward Platt let forth a cry of recognition, there was a crash and the screen went blank. Simultaneously with the blotting out of the view in this screen, there was a confused sound from the loudspeaker and, on again turning to the inner screen, the lights in the car were seen to go out. In the dim light the frozen forms of the occupants stood immovable like wooden soldiers. Then there was another crash and complete darkness. The six viewing screens connected to the permanent transmitters in the tunnel showed the normally dim-lit tube intact, but empty.

The mayor turned to Ward in amazement. "Did you recognize the man who approached and destroyed the first transmitter?" he asked.

"Yes," breathed Ward, "It was Jeremiah Talbot!"

A Recognition

WHEN the red light appeared in the tunnel, those on board the train were astonished beyond measure, but when it merged into the unholy violet radiance they were gripped by some unseen power that rendered each and every one as immovable as if moulded from bronze. Those in the rear cars who had not the warning accorded to those up front, struggled mightily against the unexpected and unseen enemy but to no avail. The car floors beneath their feet hummed with a not unmusical vibration. The unearthly radiance surrounding the cars held them awe-struck and fascinated. They were helpless to touch their rifles or pistols.

Into the cavern below, dropped the eight massive steel cars with their paralyzed human freight. A slight droning of machinery beneath told of the purely physical accomplishment of the task, but the motion was so smooth and steady as to give the impression of being carried out by some supernatural agency. It seemed they were in a dream from which they must soon awaken.

But there was nothing dreamlike about the contact of the squat hairy bodies that soon crowded into the cars and, in the semi-darkness, lifted the helpless figures of the passengers and carried them to the outside. In the blue-white light of the cavern these bodies were made out as those of a strange breed of creatures, part human, part beast. Huge, barrel-like chests characterized these strange simian monsters who wore trousers like men but exposed the naked, hairy upper, portions of their bodies without covering. Beady deep-set, black eyes peered out from beneath bushy brows in chalky-white faces of human mould. And, strangest of all, these faces were not malicious in repose. They were more like the hopelessly vacant visages of incurable idiots. Only when the creatures smiled, if their grimaces could be called smiles, were the faces evil. Of not more than five feet in height, their thick bodies surmounting uniformly bowed legs, they gave the impression of tremendous strength. And the pressure exerted on the bodies of the victims by some of those long arms left mute evidence of this strength in the form of bruises and abrasions.

The members of the police and the militia were laid on the rock floor of the cavern in long rows as if being prepared for burial. Then, when all had been removed from the train, a man, a white man garbed in gray woolens of excellent quality and cut, walked along the line and sneeringly regarded his captives. When he came to Tony and Charlie, he stopped abruptly.

"So," he said, "At last we have two scientists among us. Welcome to our realm."

He laughed aloud and to Tony's numbed senses there came the recollection of having heard that laugh before. But he could not move his head, could scarce roll his tortured eyes, so it was impossible for him to see the features of his captor.

"And now, Mr. Anthony Russell," continued the familiar voice, "We'll free you and your friend. At least you did not come against me armed."

He directed four of the monsters to carry the two men to an adjoining cavern and, as Tony was lifted to the shoulders of two of the creatures, he saw from the corner of his eye that the train they had so recently occupied was slowly moving down a section of track to join two others that occupied a siding in a dim recess of the great excavation. Above him hung the damp, rounded lower surface of the tube from which they had been kidnapped. The cavern had been hollowed from the solid rock beneath and the tube itself was shored up on both sides with rows of strong columns which prevented its collapse into the opening below.

After being carried for some considerable distance along a passage where the only illumination was from hand lights carried by their captors, Tony and Charlie were brought into a large room which might have been the drawing room of a luxurious mansion. It was lighted in the most modern manner and furnished sumptuously and elegantly. At the far side of the room there was a great oak cabinet which at first glance appeared to be a huge wardrobe. The two men were placed on their feet before this massive piece of furniture and its doors were opened. There was a click and the entire face of the cabinet belched forth a breath of heated in-

candescence that nearly threw them to the floor. But, when the dazzling brilliancy abated, they found that their muscles were once more in normal condition and that they could move their limbs freely.

Tony wheeled about to face his captors and found himself gazing into the grinning countenance of the man of the gray flannels.

"Jerry Talbot!" he gasped.

CHAPTER V

Talbot Explains

THE strangely silent beast-men retired from the room while Tony stared in open astonishment at the debonair figure he faced.

"Yes, Tony," said his unabashed captor, "it is I, Jeremiah Talbot. You are surprised to see me alive —and here?"

"Surprised?" exclaimed Tony, when he was able to speak, "Why, Jerry—you have been reported dead these seven years. Your mother and sister have mourned you, and all your friends considered you as no longer in the land of the living. What on earth really happened, and what are you doing in these strange surroundings and engaged in this nefarious work with these unearthly monsters?"

"It is a long story," replied Talbot, "But there is no hurry to relate it. You are going to be with me for a long while—from now on, as a matter of fact. Who is your friend?"

"Excuse me, Jerry. This is Charlie Frazee, the television radio wizard—Jerry Talbot, former Research Engineer of the Union Electric Company."

"How do you do, Mr. Talbot," responded Charlie, politely yet somewhat stiffly, "I remember your work and the cause of your disappearance in the company of Professor Ainsworth."

"Glad to meet you," replied their host with smiling equanimity, "It appears though that you are not as pleased to meet me. However, we'll let it pass. So you are responsible for the installation of the transmitters on the trains?"

"Yes," said Charlie haughtily, "and at a number of points in the tunnel as well. Our friends above are fully aware of what has happened now."

"So?" grinned Talbot, "What little they know will avail them nothing. And this is but the beginning."

Tony grew impatient. Not only did the calm superiority of the long-lost Jerry Talbot annoy him, but he was anxious to hear more of the purpose of this warfare against the people of the great metropolitan district.

"But, Jerry," he interrupted, "What is this all about? How came you to be here? Who or what are these strange beasts, and why are you warring on the city?"

Talbot laughed, a light of fanaticism glinting from his piercing black eyes. "One question at a time, my dear Tony. And, as I previously remarked, there is plenty of time."

"Surely you do not intend to keep us here?" asked Tony incredulously.

"Nothing else but. You are never to see the light of day again, nor are any of those I have kidnapped—unless—but that can wait also."

"This man is a criminal of the worst sort," blurted Charlie, "But, he'll get his just deserts. I'll wager he murdered old Van Alstyne, too."

"We shall indulge in no further remarks of that sort, Mr. Frazee," said Talbot, with a threatening steeliness of tone, "Yes, I did remove that old rascal, Van Alstyne. And, further than that, his daughter is now in our fair realm, a prisoner of war."

Tony bristled. "You'll not harm her, Jerry!" he warned.

"Oh ho!" said Talbot, "So the wind blows that way? But, you can rest easy on that score. The girl will not be injured. And now, get this straight —I promise that no harm shall come to you nor to your friend, Frazee, who is glowering at me so threateningly. But you must not misunderstand your position. You are prisoners in this subterranean empire of which Ainsworth and I are the absolute monarchs. It is impossible for you to escape and if you attempt to disrupt our plans or to indulge in violence of any kind, you will be summarily dealt with."

"Then Ainsworth is here, also?" asked Tony interestedly.

"Yes, indeed. When we left in my plane to escape the undesirable publicity given to our experiments in creative surgery, we had a definite plan in mind. But we had no idea that we were to become involved in so stupendous a thing as has developed. In the wilds of Labrador, Ainsworth had a secret laboratory which has since been discovered —denuded of its apparatus. We headed for this laboratory with the intention of marooning ourselves for many years to carry on the work of making humans from the lower animals. Wells' Doctor Moreau in real life, you know. But the plane crashed before we reached our destination and we were forced to carry on in the direction of his laboratory on foot. Luckily we had escaped injury in the crash but the hardships of that attempt to reach the laboratory were terrible. After two days and nights we were overtaken by a blizzard which made continued progress impossible and we took refuge in a cave about a hundred and fifty miles northwest of Shipiskan Lake. This was the beginning of our good fortune."

"But your plane was found completely consumed by fire and with the remains of human bones in the wreckage," objected Tony.

"Yes. We returned later and set fire to it to throw any inquisitive searchers off the track. The bones were not human—though nearly human."

An Underground Empire

TONY shuddered involuntarily as he thought of the ape-men who had carried him.

"That cavern," continued Talbot, "was snowbound within a very few hours, but we were quite comfortable and had provisions in our packs for a

long stay. After some time of inactivity we decided to explore our refuge and our pocket flash lamps were brought into play. We soon found that the small cavern was but the entrance to a much larger one which lay at a considerably lower level. It was a strange experience to be prowling about in this underground chamber but we carried on until we finally came to a small ledge that projected from a wall of the cavern and which appeared to extend back into still another opening. By standing on Ainworth's shoulders I was able to clamber onto this ledge and, when I had pulled him up after me, we discovered that a narrow passage led in to the solid rock from the point where the ledge joined the wall of the main cavern. It would bore you were I to recount all of our adventures but, after miles and miles of following winding passages and exploring many interconnecting caverns, we finally came upon the great discovery. Gentlemen, there is a vast underground world beneath this continent of North America and you now stand in one of its many many connecting divisions."

"What!" exclaimed Tony and Charlie as one voice.

"It is the plain, unvarnished truth," said Talbot.

"Do you mean to say," asked Tony, "that these caverns and passages extend clear down into the United States?"

"Precisely. Not only that, but they cover almost the entire continent east of the Mississippi. There are thousands of miles of passage and thousands of great caverns, one so large that it contains two lakes of the approximate size of Lake Erie and Ontario. But, some of this you shall see so there is little use in describing it to you at this time."

"These ape-men, though," asked Tony, "Are these the normal inhabitants of this realm?"

"Yes and no. Those you have seen are a development of the natives we found. Others are in a higher state of development and still others are still in their natural state. These you shall see also."

"Are there many of these creatures?" Tony inquired.

"Ainsworth has estimated their number as about fifteen million."

"Holy smoke!" ejaculated Tony, "And you have them all under control?"

"Absolutely. To them we are gods. And why not? We have lifted them out of their savagery and have provided them with many of the comforts of modern civilization. Some of them we have even given—brains."

Charlie listened in stubborn disapproval, but Tony was extremely interested. "But the money, the wealth it must involve to do such things as you have done here!" he objected.

Talbot smiled wryly. "Yes, I know my father was financially ruined six years ago and that he commited suicide in consequence," he stated, "Van Alstyne did that, but still I withheld my hand. Mother had been left with nearly a hundred thousand of her own so she could manage fairly well. But, within the past few weeks, Van Alstyne took that from her. This was too much, so I—removed him, as you know."

Tony recoiled before the look of fierce vengefulness in Talbot's eyes, but he could scarce blame him for his feeling. The expression of Charlie's face softened somewhat as he listened.

"But how on earth did you do it?" asked Tony.

"There is much to tell," replied Talbot, "But first we shall visit Ainsworth. I have an idea he will welcome you both rather gladly. And, for all your seeming incarceration, do not think that you are going to be unhappy with us. It is a pleasant life and, after a few years, you will quite enjoy it, I am sure."

Tony shrugged his shoulders at Charlie's meaning look. "Well," he said, once more addressing Talbot, "May I ask one favor?"

"You wish to see Miss Van Alstyne?" smiled their host.

"It shall be as you wish," agreed Talbot, leading the way toward a curtained recess at one side of the huge room.

An Underground Journey

HE parted the curtains and there was revealed the cage of an elevator, modern in every detail. When they had entered the cage he closed the door and pressed a button, whereupon the car dropped swiftly into its smooth-walled shaft. For an interminable period they dropped with ever increasing speed and finally Charlie could hold himself no longer.

"How deep is this shaft?" he asked.

"Something like four miles," answered Talbot.

"Four miles!" gasped Charlie, "You have cables of that length?"

"There are no cables on this car. We are falling by gravity. But it is under control and will be neutralized before we reach the bottom."

"Neutralized?" asked Tony, "Then you have discovered the fundamental laws of gravity and have learned to counteract them?"

"Yes," smiled Talbot, "But that is only one of the many remarkable discoveries that Ainsworth and I have worked out in our underground laboratories."

"Evidently," agreed Charlie, "Not the least of them, I should say, is the stealing of a subway train from under the river and leaving the tube intact."

"That is a pretty good stunt," replied Talbot, "But, when you are acquainted with the mysteries of the fourth dimension, it is really quite simple."

"The fourth dimension? Time?" asked Tony.

"No, not time. That is an erroneous impression that is in quite general acceptance above. No, the fourth dimension is not time. But you shall learn of that later. Here we are."

The cage had slowed down and now came to a gentle stop at the brightly lighted entrance to a long, rock-walled passage. As they proceeded down this passage, Tony and Charlie noted the smoothness of its walls, which appeared as if the opening

had been fused into the solid rock by some tremendous heat that left the sides as glossy as glazed porcelain. The lighting was from translucent globes overhead that shed a soft radiance that was as revealing as the glare of sunlight, yet restful and soothing to the eye.

"I can not understand, Jerry," said Tony, as they walked along the passageway, "how on earth all of this work has been accomplished in the few short years you have been here. I presume that none of these workings existed before your coming?"

"Of course not. The natives were absolutely ignorant. But they are powerful and are good imitators and tireless workers. Besides, Ainsworth and I have control of certain forces that are unknown up above and that make work of this sort much simpler in Subterrania, as we have named our hidden country."

"One thing I have noticed," said Charlie, displaying his first real sign of interest, "is that all of the caverns are lighted by artificial means. If the natives of this great underground realm lived in darkness before you and Ainsworth arrived to introduce them to modern improvements, how is it that they have perfect organs of sight. I should think they would be without eyes, like the fish in the waters of some of the caves of Kentucky and West Virginia."

"Oh, but they did not live in darkness before we came. These are all artificial caverns you have seen. The larger natural caverns are lighted by phosphorescent materials in the walls and roofs. This light is not as bright as sunlight, of course, but is sufficiently bright for normal sight and will permit of reading without difficulty. There is no night in Subterrania unless one enters the smaller connecting caverns or passages where there is no phosphorescence."

They now emerged into a larger chamber and, following their guide, proceeded up a gentle incline to a large, metal-studded door. Talbot inserted a key into its lock and they entered the strangest room they had ever seen. It was reminiscent of one of the buildings of a large prison, excepting that there were no barred cell doors. Instead there were tier upon tier of rooms around the sides and, for some seven or eight floors above, each tier of rooms was surrounded by a balcony that could be reached only by a small lift that connected the various levels. Talbot led them to one of the many doors on the main floor and this opened at his manipulation of a dial on its surface like the combination of a safe.

The opening of the small metal door revealed to their gaze a plainly but well-furnished room. At their entrance a young girl, with golden locks about her shoulders in enchanting disarray, sprang from a divan where she had been reading and jumped to her feet in some alarm. It was Margaret Van Alstyne and when she saw Tony she flushed with pleasure and advanced to him with outstretched hands.

"Anthony—Mr. Russell," she faltered, "You have come for me?"

CHAPTER VI

Tony Accepts Confinement

TALBOT observed with an ironic smile the somewhat embarrassed greetings exchanged by Tony and Miss Van Alstyne.

"I'll answer your question, Miss Van Alstyne," he said, "Mr. Russell has not come for you. Like yourself, he is a prisoner. But it is my pleasure that you be given the freedom of Subterrania and I shall release you from your present confinement in Mr. Russell's custody, provided he gives me his word of honor that no attempt be made to evade my law."

Margaret looked at him with fear, not unmixed with curiosity.

"What is your law?" asked Tony.

"You are to become permanent residents of Subterrania," replied Talbot, "and as such are subject to all laws of the realm as enacted and enforced by Ainsworth and me. In addition you are to make no attempts to communicate with those above us and are not to leave the confines of the city Olaka unless by my express permission."

"If we do not agree?" asked Tony.

Talbot shrugged his shoulders. "Miss Van Alstyne will remain in solitary confinement and will later become a subject for our experiments. Understand me, Tony. It is with no tenderness toward the daughter of Wolf Van Alstyne that I make this offer. It is for the simple reason that I bear you some friendliness that dates back to our college days and I know it will give you pleasure to have the young lady free and in your company. Do you accept the condition?"

Tony nodded slowly and unwillingly. Through his mind there rushed the remembrance of some of the "experiments" credited to Talbot and Ainsworth by the newspapers some years before—experiments in which the alleged torturing of dumb animals figured to an extreme that was horrible to contemplate.

"Yes, I agree. I give you my word," he said.

"Good," said Talbot, "now, we shall visit Ainsworth."

He failed to observe the wink that Charlie indulged in for Tony's benefit. Frazee had made no promise.

They returned to the elevator by which they had descended and were soon slipping rapidly deeper into the lower regions of the strange realm. As the car dropped speedily through the smooth shaft Tony remarked on the even temperature of the atmosphere.

"The temperature," said Talbot, in explanation, "is almost uniform at seventy-four degrees Fahrenheit the year around. This was a great surprise to us when we first came to Subterrania, for all evidence of mining and drilling operations above point to an average increase in temperature of one de-

gree for each one hundred feet descent below the surface of the earth. This would mean a temperature of more than 500 degrees at ten miles below the surface but there are portions of our realm much deeper than that and the temperature is no greater than at this level. But we have accounted for this in the refrigerating effect produced by the evaporation of moisture in the larger areas where animal and vegetable life is abundant."

"Is the atmosphere of constant density and oxygen content?" asked Charlie.

"Yes, excepting for the difference accounted for by the varying pressures at different levels. The elimination of carbon dioxide and the replenishing of the oxygen supply is accomplished by the natural functioning of certain plants and fungi in much the same way as this is done on the surface. The relative humidity is high, but you will not find it uncomfortably so."

"There are no openings to the surface excepting the one in Labrador?" asked Charlie.

Talbot laughed. "That one has long since been sealed," he replied, "but there is one other by which we maintain unsuspected contact with the outer world. It is cleverly concealed in the heart of an unscalable mesa in Arizona."

"Then your domain does extend west of the Mississippi!" exclaimed Tony in surprise.

"Only to the one point," said Talbot, "and this connection is by a tunnel we have produced since our coming—a tunnel more than twelve hundred miles in length."

Tony whistled in astonishment. "Jerry," he said, "I have asked you before how such stupendous tasks have been performed—engineering marvels that cost millions of dollars and require years to accomplish on the surface—but you have evaded me."

Talbot grinned his appreciation. "Tony," he said, "you spoke of riches. Were Ainsworth and I to return to your world we would be the wealthiest men alive. There are untold millions in precious metals and gems here—billions, were they converted into American money. We could, if we wished, upset the money market of the world in a very few weeks. Some small amount of this vast wealth makes its way above through our agents who contract secretly for certain fabricated materials and machinery we can best obtain in this manner. But as to the years of labor and the necessity of employing great armies of workmen in engineering projects, there is no such necessity here.

"In addition to our discoveries in connection with the fourth dimension we have also discovered the secret of atomic disintegration. We have at our command an undreamed-of force that is released at the touch of a finger. Were it not under complete control—were it permitted to continue unchecked when once started— the annihilation of the world would result. The twelve hundred mile tunnel was bored in a matter of weeks by a carefully directed progressive disintegration of the material through which it passes. It is as straight and smooth as the bore of a rifle and the direction of the energy that produced the result was by the hands of Ainsworth and myself."

"Ye gods!" exclaimed Tony, "no wonder you are so cocksure about what you can do in the way of imposing your will on the world. But what is the purpose of your enmity?"

Talbot scowled. "We'll leave that until we see Ainsworth," he responded shortly, "we change cars here."

Across Subterrania

THE cage halted at another large chamber where they found a small, torpedo-shaped car waiting in a smooth groove in the rock floor. They were led to the shiny metal side of the vehicle and Talbot opened a door that led into its padded interior.

"Enter," he said, smiling as he handed Margaret into the opening.

When they were all ensconced in cushioned seats that lined each side of the car, Talbot closed and bolted the door.

"It is eight hundred miles to Olaka," he said, "but we'll be there in an hour."

"An hour?" asked Charlie incredulously.

"Just about. And I must warn you to settle back deeply into the cushioned chair-backs. The acceleration is terrific and you will scarcely be able to move when we have reached full speed. Just sit quietly and do not worry about the deceleration when that is necessary, for the chairs rotate automatically at the instant it starts so that the pressure remains against your backs throughout the journey. Let's go!"

The car started smoothly and silently, entering the black mouth of a tube of not more than twelve feet diameter. The whistle of the air compressed between the car sides and the bore of the tube soon rose to a shrill note that told of tremendous speed.

"How is the car propelled?" shouted Tony.

"Atomic energy," replied Talbot, "it does not touch bottom or sides of the tube, but is supported on a cushion of the air it compresses during its journey."

Tony turned his head with difficulty to look at Charlie. He nodded jerkily in wonder. They were traveling at about one thousand miles an hour and the pressure between their bodies and the air cushions behind them was so great that it was almost impossible to move a muscle. The uncomfortable position and the trouble in making themselves heard over the shrill note of the swift passage kept them silent throughout the remainder of the journey.

When the car reached its destination they stepped into the open with expressions of astonishment that caused Talbot to smile and chuckle.

"Why—why—it's beautiful," gasped Margaret.

They stood near the shore of a great body of water and, but for the different quality of light, it would have seemed that they were in the open air

of their own world. Far overhead swept an arch of deep green that merged into nothingness in the distance where its color seemed to melt into a fathomless distance comparable to the heavens themselves. It seemed that there were five blue-white suns in this firmament—but no stars. Open-mouthed they stared at the wonders and beauties of Subterrania.

"The suns," explained Talbot, "are great patches of phosphorescent materials imbedded in the arched roof of this huge cavern. The farthest is some six hundred miles from this point and it is the largest of all."

"Six—hundred—miles?" intoned Charlie, "for heaven's sake, how large is this space?"

"It is more than seven hundred miles in length and well over four hundred in width," said Talbot, "its two lakes, Atakna and Atakna-og, are the two of which I spoke previously. Olaka is but a few miles along the coast.

"And the height?" inquired Tony.

"Eighty miles at the zenith. We are nearly one hundred miles below Chicago where we now stand. This cavity is a huge air-bubble in the earth's crust that was left during the process of cooling. It is the largest in Subterrania."

"It is the most amazing thing I have ever witnessed," said Tony, "who, in our world above, would suspect that such a world exists beneath their feet?"

The air was redolent of sweet odors of growing things and Margaret exclaimed again and again at the beauty of some new growth that attracted her attention. She had drawn a few feet from the three men and suddenly gasped as her eyes rested on a most unexpected sight.

"An airplane!" she called out.

Again Talbot smiled as the two men turned to confirm her discovery. The airplane was a trim little thing of not more than thirty feet wing spread —a modern biplane of the cabin type and capable of seating five passengers. Tony and Charlie walked to the craft to inspect it and Margaret gurgled delightedly when Talbot informed her that the plane was to carry them to Olaka.

"Where's the engine in the confounded thing?" Charlie was asking as Jerry and Margaret reached the plane. For, though there was the conventional propeller at the forward end of the boat-like body, there was no evidence of a driving motor.

"It's in the shaft," laughed Talbot.

"In the shaft?" ejaculated Tony, "for the love of Pete! What is its power?"

"About three hundred horse. It is an atomic engine, using water as a fuel and is but three and a half inches in diameter and eight inches in length. The release of atomic energy from less than four pounds of water will drive the plane the full length of this cavern."

Tony stared. "Great guns, Jerry," he gasped, "why aren't you in your rightful sphere? You'd revolutionize the world."

"Yes," growled Talbot, "and to whose advantage? Some rascal like Wolf Van Alstyne would maneuver things to his own benefit." He hesitated. "Oh, I beg your pardon, Miss Van Alstyne," he apologized, "I had forgotten your presence."

Margaret raised her head proudly. "Granted," she replied without rancor.

An Attempted Rescue

AFTER a moment of embarrassed silence, the four clambered into the cabin of the plane and Talbot took his place in the pilot's seat. At a touch of his finger there was a whir that rose to a muffled roar. The propeller spun rapidly and, with the stick pulled back as far as it would go, Talbot sent the plane into the air with a rush that carried it from the ground in less than twenty feet of taxying. They swept out over the green-lit lake at tremendous speed and were soon out of sight of the shore. Overhead the misty green arch and the five blue-white suns shimmered with a wavering eerieness that reminded the visitors of the Aurora Borealis.

It was not a long trip to Olaka and, when the plane headed for the south shore of the lake and the sprawling city came into view the visitors exclaimed anew at what they saw.

A single magnificent building of some three hundred feet in height rose above the rest of the city. On all sides along the coast and back inland spread the streets and squat dwellings of the underground capital. Mere huts, these dwellings seemed to be. And they were circular-walled and domed like an igloo. But the oddest incongruity was the color scheme. The single main building which rose so majestically from the orderly rows of domed huts was of a rich golden yellow. The huts themselves presented all the colors of the rainbow and, chameleon-like, they changed color with the flickerings from the five light sources.

The view of the city was blotted out as the plane circled over the flat roof of the central building and in a moment Talbot had brought them to a perfect landing on the smooth surface.

"Welcome to Olaka," he said as they alighted.

Five minutes later they were in the presence of Professor Ainsworth, that famous scientist of a few years back who had been disowned by his government and by his contemporaries.

The tall figure of the once noted savant bent tensely over a circular table that was placed in the exact center of a huge room that was cluttered with laboratory equipment. So absorbed was he that he did not look up from his close scrutiny of the table top until they had approached within a very few feet of where he stood.

"What is it, Prof?" asked Talbot, in a quiet voice.

The tall figure straightened at the question and, with hardly a glance at the newcomers or recognition of their presence, he pointed a long finger at the table top.

"Look," was his sole comment.

They all bent over the circular surface which proved to be the viewing screen of some sort of television apparatus. Tony drew a quick breath

as he saw that the scene depicted was the interior of the subway tunnel at the point where the trains had disappeared. At the moving of a control lever the view shifted slowly from end to end of the tunnel, which was now brightly lighted by auxiliary flood lights of great power. It was packed with soldiery, armed to the teeth! And, at the exact spot where the last train had vanished from the viewers in New York, a gang of workmen was busily engaged in burning a way through the iron tunnel with acetylene torches!

Talbot chuckled sardonically, but Charlie groaned as he observed that Ward Platt was directing the labors of the welders.

"Has the shaft been closed off?" asked Talbot.

"A half hour since," replied Ainsworth, "four miles of rock now separate them from our lower passages."

"And the prisoners?"

"Are safely below. They'll find no living beings when they break through into the cavern. All they'll find is their silly subway trains—and eternity."

"Good God!" cried Charlie, "you'll not destroy them?"

Ainsworth looked the speaker over coolly. "And why not?" he asked.

"It's murder—cold-blooded murder!" exclaimed Charlie.

"And what would they do with their rifles and machine guns if they reached us?" inquired the scientist.

There was no reply, for the three visitors were once more watching the screen intently.

A great section of the tunnel bottom had fallen into the cavern below and the opening thus created was ringed with soldiers, who were prepared to shoot on sight of the ape-men who had been glimpsed in that brief instant in the Wall Street viewing screens. Ainsworth pressed a button at the edge of the table and the lights in the far-away cavern were extinguished. Then came the portable flood lights of the militia and rope ladders were dropped into the pit. Ward Platt was the first to clamber to the rock floor below and Charlie could not repress a useless cry of warning that sprang to his lips. The soldiers followed by hundreds and, when all were assembled in the great cavern, the watchers saw them prowl about and eventually come upon the abandoned trains where they reposed on the subterranean siding.

Ainsworth reached for another button and Charlie struck for his arm as he suddenly realized that this meant death to those distant hundreds of human beings—his friend and partner among them. But his blow, quickly as it struck, was too late. The button was pressed firmly before Charlie's fist struck the outstretched hand.

The screen was blotted out by a great burst of flame as a terrific explosion rent the air of the cavern. Then all was darkness.

Margaret screamed and Charlie cursed. Tony stared unbelievingly. Ainsworth cackled with the glee of a madman, the while he rubbed his bruised arm. Talbot twisted the corners of his mouth into his derisive smile.

CHAPTER VII

Into the Fourth Dimension

STUNNED into a moment of inactivity, Charlie quickly recovered and, with a roar like a lion, sprang for the throat of the man who had wrought the destruction. But Talbot had anticipated some such move and, before Charlie could reach his intended victim, there flashed into sudden view a crackling blue flame that contacted with the body of the leaping man with a blinding impact. There was an instantaneous rumble in the air of the room—then a jarring thump that seemed to twist the supports of the building. In Talbot's extended hand there was a glowing bulb from which the energy had emanated. And on the spot where Charlie's lithe body had met with the strange force there was—nothing. Charlie had vanished as completely as had the body of Wolf Van Alstyne!

Margaret paled and bit her trembling lip. Tony rubbed his eyes in disbelief.

"You've killed him!" he gasped.

"No," replied Talbot, "I have better uses for your friend. I have merely suspended his three-dimensional existence temporarily."

"That fourth dimension stuff again," grunted Tony in relief, "then you can restore him to normal existence?"

"At any time within about one hour," stated Talbot, "but he'll have to behave himself if I do."

Tony shook his head in complete mystification. "I can not comprehend it at all. Yet, in view of what we have witnessed, I can not refuse to believe," he said.

Ainsworth puttered about the horizontal viewing screen as though nothing unusual had occurred. Margaret listened in amazement to the brief explanation given to Tony by Talbot:

"The fourth dimension, as I mentioned before, is something quite different from the popular conception of it. Ours is a many dimensional universe as has long been shown by mathematics, the first four dimensions being essential to the existence of a visible body.

"Suppose there could exist a two-dimensional world. We might represent it by a sheet of paper having only length and breadth, which is of course impossible. But suppose it did exist and that a circle marked on such a sheet represented a room. A two-dimensional being on the sheet could not enter the room since he could move only on the surface and could not pass the outline of the ring which would, to him, represent the wall of the room. However, you or I could pick up this being and place him within the circle since we live in a world of more than two dimensions and can normally move in the first three.

"Substitute our commonly known three dimen-

They were horrified to see her struggling with a seven-foot giant who was carrying her away unmindful of her squirming or kicking

sions. A room has three perceptible dimensions and, if there are no openings through which a body may pass, it can not ordinarily be entered. But we can do so by means of the fourth dimension, which we may designate as duration of existence. In our many-dimensional world a body must have a definite duration of existence, in addition to length, breadth and thickness, else it is not existent to our perceptions. Your friend is now in that condition —to us he does not exist, since he has been rotated entirely outside the perceptible three dimensions and exists only in the fourth which to us is unperceivable. Do you follow me?"

"No," admitted Tony frankly, "but I do get a glimmering of the nature of this fourth dimension, even though I do not understand how you control it. This then was the means used in removing the subway trains from the tunnel?"

"Yes. Of course, far more powerful apparatus was required but we merely provided for an interruption of the existence of the tube bottom for a sufficient period of time to allow of lowering the trains into the cavity beneath the tube."

"And Van Alstyne?" whispered Tony so as not to be overheard by Margaret, who had returned to the viewing screen where Ainsworth still remained.

"The same thing," said Talbot, "excepting the energy was used only on the heart of the old rascal. It was rotated entirely out of the first three dimensions permanently. Were an autopsy performed it would have been impossible to find the organ, since its duration of existence had been definitely discontinued. Later we used the energy on the entire body and removed it to one of our laboratories in its relatively non-existent state."

"He has been restored then?" asked Tony hopefully.

"Not to life. That would be impossible, with the heart non-existent for so long a period. But his body was restored to the condition in which you found it in Cartersville. It now lies on one of our dissecting tables."

Tony shuddered but, horrible as was this cold-blooded disregard of human life, he could not help but admire the scientific achievements of this man.

"Watch," continued Talbot, "we'll restore Charlie."

He stepped to a wall switch and made a quick adjustment. The normal lighting of the room dimmed and, in its stead there came a penetrating orange glow that filled the room with throbbing pulsations. The jarring thump followed—the sensation of wrenched physical support—then Charlie stood before them, somewhat dazed yet quite unharmed.

"Why—why," stammered Charlie, "I heard every word of your conversation, yet I could not touch you. I could see through you as if you were all made of glass; through the walls; through the crust of earth above and into the depths of the heavens. It was the most remarkable experience I have ever gone through. But I seemed to be weakening rapidly."

Margaret had looked up from the screen, startled by the orange glow and the events succeeding its appearance. Now she recovered and pointed to the screen in great excitement.

"Watch this," she cried, "all are not dead in the cavern."

The three men rushed to the viewing screen and there saw the destruction which had been wreaked by the explosive touched off by the arch-fiend, Ainsworth. The cavern was lighted by new flood lights that had been brought into play by reinforcements who evidently arrived after the blast. The interior of the cavern was a mass of wreckage and many of the first detachment of soldiers had been blown to bits. The cars of the three trains lay in torn and twisted heaps on the underground siding. The opening from the tunnel above was considerably enlarged. Many of the victims were still alive however, some mutilated and torn but others apparently very little the worse for their experience. The newcomers assisted those they found alive to the new rope ladders they had let down and one by one the survivors were helped to the outside. Finally Charlie let forth a cry of joy.

"There's Ward," he shouted, "he's alive!"

It was true, for one of the rescuers dragged from a heap of bodies the bedraggled form of a man in civilian clothes. He was bloody and grimy but was able to stand on his feet when raised to an upright position. Charlie gurgled his glee when his partner turned his face into plain view of the watchers and then hobbled unaided to the nearest ladder.

Ainsworth growled his dissatisfaction. "We only got about half of them," he complained.

Even Talbot looked at him with disgust. "That's plenty," he snapped, "the lesson was the main thing we wanted to get across. And I imagine they've had enough for some time. Glad your friend escaped," he concluded, turning to Charlie.

They Talk It Over

THEY left the presence of Ainsworth who, unmindful of their conversation, had returned to his contemplation of the viewing screen. Talbot led them through the spacious halls of the palatial building and assigned living quarters to each of the three. It appeared that they were to be comfortable at least and Talbot displayed every solicitation for their welfare. He was a strange anomaly, this master of the underground realm in which they had so unexpectedly become residents. His hatred of mankind in general contrasted vividly with his suavity of manner and his kindness to his captives.

He left them to their own devices with the parting information that he would return in an hour and conduct them to their first meal in Subterrania, which was to be served within that time.

Tony busied himself removing the grime he had accumulated on hands and face during the preceding experiences. As he passed the connecting door between his own and Margaret's apartments he

thought he heard a choking sound from the other side of the partition. He paused and listened closely. Yes, there it was, a stifled sobbing that recurred at frequent intervals and wrung the heart of the listener. He berated himself for not having shown the girl more sympathy in her bereavement and in the predicament in which she now found herself. He and Charlie had much to interest them and to make life bearable in this unbelievable realm into which they had so unexpectedly plunged. But the girl, recently the witness of her father's violent death and the disappearance of his body, had every reason to long for her own accustomed surroundings and to get away from the terrible underground world. She had also the fate of her brother to cause grave concern, not to speak of the loss of the companionship of her own friends and relatives in the hour of trouble. And Tony had given his word that no attempt should be made to return her to the upper world.

Soon the sobs ended and he could hear the girl stirring about in her rooms, so he completed his own ablutions and stepped to Charlie's rooms to join his friend. Charlie grinned sourly at his appearance.

"A fine mess we let ourselves in for," was his greeting.

"Looks that way," agreed Tony, "for myself I do not care so much, but this is going to be mighty hard on Miss Van Alstyne."

"Sure is," said Charlie, "and I don't see how in the devil we are ever going to get out of here. Wonder what they are doing with the rest of the gang they kidnapped."

"So do I. Though I fear there is not much mystery about that. Undoubtedly they are to become the subjects of some of the blood-curdling experiments of the demented Ainsworth."

"What on earth do these experiments consist of, do you suppose?"

"Why there was never any direct proof that Ainsworth had tortured animals needlessly in his reconstruction work, but enough evidence was obtained to enable the authorities to revoke his license to practice medicine and surgery. You'll remember that Talbot, who had been assisting the professor, always maintained stoutly that the work was entirely painless and that much good to mankind and to the subjects of experiment would result."

"I have often wondered how Talbot became interested in that sort of thing. He was a physicist and an experimenter along the lines of atomic science, high frequency vibrations and the like. What connection can there be?"

"It must be that the discoveries of Talbot led into the field of knifeless surgery," replied Tony, "you know there has been some surgical work accomplished by the use of penetrating rays, but this was never developed to any great extent as far as I know. It is quite possible that here is where Talbot fits into the thing."

"That's right," mused Charlie, "and we must admit that he has done some wonderful things here. This fourth dimension business is positively uncanny."

A Beast At Large

AT this moment their ears were assailed by a terrified scream from the corridor and both men rushed to the door, stumbling over each other in their eagerness to reach it. When they burst from the room and stared down the long hall, they were horrified to see Margaret Van Alstyne struggling with a naked giant who had picked her from the floor as if she were a child, and was carrying her away, unmindful of her kicking and squirming.

This huge man, for human he was, stood no less than seven feet in height and his body was matted with hair, yet showing extreme whiteness of skin in the uncovered portions. When the giant saw them, he dropped the frantically struggling girl and turned to face the new enemies. He tossed his great head to throw back from his eyes the long brown hair with which it was crowned. His lips writhed, revealing a gleaming set of strong, perfectly-formed teeth in a sneering grimace. Bushy brows surmounted the most remarkable pair of blue eyes imaginable but in those eyes there was something that sent a chill of fear through the visitors. It was not exactly the ferociousness of the glare that came from their depths, but rather a mysterious, unfathomable mystery that was somehow inhuman.

Seeing that the two men were regarding him with indecision, the brute again reached for the girl and she drew back in alarm. Tony cried out his rage as the hairy paws laid themselves on the shoulders of the trembling girl. With a rush that reminded Charlie of the old football days he was upon the monster. He sprang high in the air and landed on the giant's back, wrapping his legs about the middle of his body and twisting his arms around the thick neck in a strangling hold. But he was no match for this brute who spoke not a word but, with a quick wrench of his steel-muscled body, broke Tony's hold and flung him to the floor. Tony, on his feet in a flash, sprang again, only to meet the great hairy paws of the monster, which now grasped him and twisted his body into a position that spelled certain breakage of the spine if the pressure was increased. Charlie jumped in to assist his friend and Margaret screamed again and again.

"Crom!" snapped the voice of Jerry Talbot, from only a few feet distant. He had approached unnoticed by the contestants and now faced the brute with a smile of contempt on his cruelly handsome face. "Drop him, Crom!" he ordered.

Tony was released and he dropped to the floor in an ignominous heap. His huge assailant dropped his eyes before the glare of the master and, with an infantile whimper that seemed ludicrous when issuing from so bulky an individual, he wheeled about and made off down the hall with shuffling swiftness, occasionally turning his head

to see if Jerry was pursuing him. Then he sidled through an open door and was gone.

Jerry laughed. "Nearly came a cropper, didn't you?" he said.

"I'll say so!" exclaimed Tony, who had risen to his feet and was assisting Margaret to hers, "who in the name of time was that?"

"Oh, that is only Crom," replied Talbot carelessly, "one of our experiments, you know."

Charlie glared at their captor impotently while Margaret sobbed in hysterical relief. Tony rubbed his bruises ruefully.

CHAPTER VIII

The Story of the Pithies

AINSWORTH presided over the table during the meal that followed. He glowered continually and spoke not a word to the captives that was not made absolutely necessary in the business of dining. His nervous twitchings and grimaces were a constant source of wonder and irritation to the visitors, though Talbot seemed not to notice these peculiarities. It was evident that the self-exiled professor was in a state of extreme mental strain.

Margaret toyed with her food at first but soon discovered that she was unusually hungry and that the strange viands were really delicious. Several varieties of fish there were and meats which Talbot explained were obtained from reptilian animals with which the underground realm abounded. There was no bread, but a mealy tuber, of considerable size and apparently roasted or baked, provided an excellent substitute. A tart jelly of glutinous consistency and of brilliant purple color served as a delicious spread and as a condiment as well. The visitors were much refreshed and heartened when the meal was finished.

Ainsworth, without so much as excusing himself, rose from the table and hobbled hurriedly from the room.

"He can't keep away from the operating rooms," laughed Talbot.

"What sort of experiment is he now engaged in, Jerry?" asked Tony, "and what is the motive in all of this work you have done here in Subterrania?"

"I'm not averse to answering all of your questions," replied Talbot, handing cigars to the two men and lighting one himself, "since it will be impossible for you to betray us to the upper world. It is a rather long story but I might as well start at the beginning.

"When we first entered this realm, after being literally ostracised and practically forced to leave by our enemies above, we were astonished to find a near-human population. The natives, whom you have not as yet seen, are ape-men of the same general characteristics as the *Pithecanthropus erectus* of about a half million years B. C. But they had progressed to a civilization approximating that of the third interglacial period or about 75,000 years B. C. when chipped stone instruments were first made and used. Pithies, Ainsworth called them, and the name has stuck. They have no language but are able to use a few guttural sounds and have a limited number of combinations of these with the two vowels 'o' and 'a' for the designation of similar objects. Thus they pronounce quite plainly O-lak-a, their name for this city.

"Our first experiments involved changing only the physical characteristics of these creatures by surgical and medical means. We thus produced some two thousand of the higher type you saw in the cavern. These we call Grimaldi for they are of about the same physical appearance as the race of that name which flourished on the surface some 25,000 years B. C. Later discoveries and experiments enabled us to produce creatures such as the one who attacked you in the corridor, truly supermen physically but, as yet, woefully lacking in brain power."

"Did the natives submit willingly to these experiments?" inquired Tony.

"Yes, though in fear and trembling at first. You see, when we brought our scientific paraphernalia, we performed some stunts for them which convinced them that we were gods and were endowed with powers they could not hope to overcome. The first subjects for our experiments were given up more or less as sacrifices to the new gods, but when the results of our work became evident we had no difficulty in obtaining all the material we wanted. The Grimaldi are so superior to the Pithies physically that, even with their dull intellect, they could not fail to see the advantage in being thus altered. And then the reconstruction process was painless, since all radical alterations were made with the subject completely anaesthetized. The later supermen, numbering only about five hundred so far, have not as yet been released so the Pithies and the Grimaldi do not know of their existence."

Talbot's Ambition

"BUT what is the purpose of all this?" asked Charlie testily.

Talbot raised his eyebrows at the tone of the inquirer's voice. "Why," he said coolly, "the main purpose is for the advancement of science. We are going to create a race of supermen, endow them with the best brains that can be obtained from the upper world and set them loose eventually to assist us in conquering and ruling the surface. It is a rotten civilization above, as you must all admit, and Ainsworth and I intend to correct its faults and make of it a worth-while aggregation of peoples."

His dark eyes gleamed with fanatical ambition as he spoke and Tony hesitated before propounding the next question.

"You mentioned endowing these creatures with brains from above," he asked, "what does this mean?"

"It means that we are commencing a systematic

kidnapping of residents of the upper world with the express intention of taking from the best of them their knowledge and reasoning power and giving it to these supermen we are creating."

Charlie and Margaret stared aghast. Tony's cheeks blanched. "And the victims?" he inquired, "what becomes of them when their—er—brains have been taken from them?"

Talbot shrugged his shoulders. "They remain physically unimpaired and will make good laborers. But they become morons—or lower. However, they could serve no higher purpose in their narrow, useless lives above. The knowledge they acquired on the surface will live on and become mightily useful in bringing about and sustaining the golden age that is to ensue."

Margaret shivered. "I think it is terrible," she said, "it is an outrage that should not be tolerated."

"Not to be tolerated?" repeated Talbot, with rising inflection, "why, my dear young lady, we are the tolerators. Who is there to gainsay us? Who to determine what we shall or shall not do? We are the masters of the world and will soon show our hand far more effectively than in the minor expedition that has already been made against your city of New York."

"Then there are to be other kidnappings?" asked Tony.

"Yes indeed. We must obtain many subjects for the psycho-transference operations. Ten thousand of the supermen are to be equipped with brains—with reasoning power and intelligence to as high a degree as can be provided by the not overly well-endowed inhabitants of the United States. And the preliminary campaign of terror which will probably continue for the next seven or eight years will assist us materially by breaking down the morale of the peoples of the upper world and leaving them in a state of demoralization at the time we finally strike our decisive blow."

"And must we remain in this awful place until you have conquered our world?" asked Margaret.

"Yes. I'll do my best though to protect you three from my partner and to see that you return safely to your homes when the time comes. Ainsworth has already requested that I give you up to him for use in the psycho-transference experiments. Should our project fail you must always remain here. I see little likelihood of its failure, however."

Margaret bit her lip and was silent. Charlie gritted his teeth in helpless rage while Tony regarded Talbot critically.

"Jerry," he said, "this is an elaborate program you have outlined. Are you and Ainsworth the sole humans engaged in the undertaking?"

Talbot hesitated. "No," he finally admitted, "there are about one hundred others, though they spend most of their time on the surface. These are radicals who have been banded together during our several visits to the surface and they maintain our contact with the upper world. They have a permanent encampment atop the mesa in Arizona where our long tunnel terminates. Their homes are visible only from the air and, since the locality is well off the regular lanes of air travel, there is little danger of their discovery. They are equipped with several large planes which are used in transporting our purchased materials from the points of manufacture to our tunnel entrance. All purchases are paid for in gold and are ordered in the name of a mythical mining company, so no suspicion has been aroused."

Ainsworth entered the dining room at this juncture. He was obviously much excited and his claw-like hands trembled agitatedly as he spoke.

"Come, come, Jerry," he babbled, "it is done—the first of the new men are ready. They are marvelous. We have succeeded beyond our wildest dreams."

He paced to and fro in his impatience, his crouching limp becoming more noticeable than ever. Talbot rose from his chair and followed his partner from the room.

"You people may as well join us," he said over his shoulder, "you'll see some confirmation of what I have just told you."

The Human Experiments

THEY followed through one of the long corridors and into a white-walled room that reeked of ether. Ainsworth carefully opened the door to an adjoining room and the visitors followed their captors into a typical hospital ward where no less than fifty giant patients lay beneath their clean white sheets. One, in a far corner of the room, was sitting erect in his cot and staring about him in wonder, as if he was observing his surroundings for the first time. To him Ainsworth led the way at once.

"Gorth," he addressed the blond giant, "how do you feel?"

In strange contrast to the first of the giants they had seen, the eyes of this Gorth were bright with intelligence. "Fine," he replied, in perfect English, "excepting that I am weak and dizzy." He raised a huge paw to his forehead in a wondering gesture. "I do not understand," he continued, "my memory of past conditions is somewhat fogged, yet I have the feeling of having been raised from base savagery. Even the words I use are unfamiliar to my tongue, yet I can use them perfectly to express my thoughts. And my thoughts are of strange things—of a new world where all is different, where men live in great buildings and travel in strange conveyances."

"Better lie down now, Gorth," admonished Ainsworth, "you'll not be well enough to get up for two or three days yet."

He turned to Talbot in triumph, ignoring the visitors. "What did I tell you?" he exulted, rubbing those claw-like hands over one another in a frenzy of nervousness.

Talbot's eyes shone with exultation. "It is a success," he gloated, "we shall become masters of the world, you and I, even as we planned."

He threw his arm over the skinny shoulders of his mad partner and the two gazed long and earnestly at their handiwork. The visitors exchanged glances of helpless wonder.

"Well, what do you think of it?" asked Talbot, turning to the visitors with a triumphant smile.

"It is a wonderful accomplishment," commented Tony, speaking very slowly, "yet a criminal one. We can not approve of your work, Jerry."

Talbot indulged in his characteristic shrug, making no reply.

There was a commotion in the adjoining ward. A masculine voice rose again and again in incoherent shouts and Talbot and his limping partner rushed through the connecting doorway, closely followed by the three visitors.

The sight that met their eyes was similar to that in the first ward, with the exception that here the patients were humans who had been kidnaped in the attacks on the subway tunnel. The commotion was being raised by a bewildered little man who scampered about the room attired only in a regulation hospital night-shirt. When they entered the room he approached them timidly, the light of hopeless witlessness in his pale blue eyes. His voice lowered to a meaningless, confidential babble and the visitors sickened at the beseeching look that came from his puzzled, uncomprehending eyes. He fawned upon Ainsworth like a pleading dog and Margaret turned away from the sight with tears in her eyes.

This had been an intelligent man, a prosperous business man of middle age by his appearance. But now he was little more than a helpless animal, bereft of memory, speech and reasoning power. The work of the experimenters had been complete.

"My God!" Charlie burst forth, unable to contain himself longer, "you're a pair of murderers! Worse than murderers! This is the foulest thing I have ever imagined of the most savage of savages. You —you—"

He stammered in impotent rage. Talbot looked at him with an uncompromising smile of tolerance but Ainsworth snarled like a beast and sprang for his accuser, twisting his talons into the flesh of Charlie's throat with bestial ferocity. Like a flash the surprised prisoner recovered and, with a quick uppercut, smote his mad attacker a terrific blow under the chin. Ainsworth loosened his hold with a groan and toppled to the floor in a senseless heap.

Quick as a flash there appeared in Talbot's hand a small glass bulb which glowed with a sudden spiteful carmine. This time there was none of the crackling blue flame that had marked the ending of Charlie's previous outburst. There was merely a hum of throbbing intensity and Charlie's body stiffened to a rigidity like that induced when they were first captured. His body toppled to the floor like a log to lie beside the helpless figure of the unconscious Ainsworth.

"That'll be about enough of Frazee's activities," said Talbot, replacing his weapon in a side pocket, "from now on he is to remain in close confinement or he'll be killing Ainsworth. But my promise to you holds good—you'll not be harmed—only you must return to your quarters now and remain there until I call for you."

Tony opened his mouth to speak, his jaws working with fury. But Margaret slipped a trembling hand over his mouth.

"Come, dear," she whispered in his ear, "don't make things worse. I am depending on you to protect me, you know."

Tony subsided and he and Margaret walked quietly from the ward as Talbot bent over his fallen partner and attempted to revive him.

CHAPTER IX

A Realization of Power

THE corridors were long and so similar in appearance that Tony and Margaret soon lost themselves and were unable to locate their rooms. They attempted to retrace their steps and finally encountered an open door that they took for the entrance to the hospital wards they had just quitted. But this door led them into a sort of a library where the most conspicuous object in sight was a large wall map which immediately revealed itself as a map of the underground reaches of Subterrania. This map incorporated an outline of North America with the caverns and tunnels of the sub-surface realm superimposed in red ink on the familiar lines indicating coast and state boundaries. They lost themselves in contemplation of the truly vast extent of this unsuspected hidden land.

"See this," said Tony, placing his finger on the point marking the location of the city of Chicago, "this is where we now are, according to what Talbot has told us. Here is the tunnel through which we came."

He traced an almost straight line leading nearly due east to New York City. The main cavern as outlined on the map extended from Chicago on the north to a point slightly below Hattiesburg, Mississippi on the south. Its left boundary passed under Paducah, Kentucky and the extreme eastern limit was beneath Bristol, Tennessee. From a point almost below Jackson, Mississippi there extended a long red line that ended some fifty miles west of the Arizona-New Mexico border. There was a second large cavern under eastern United States, this one being about 450 miles long and 150 miles wide and lying mostly under the state of Virginia with its northern end crossing Maryland and extending into Pennsylvania and its southern end just reaching to the northern border of South Carolina. There were a number of red lines indicating connecting tunnels between the two caverns and these were far from straight. They twisted and wandered about, indicating that they were natural rather than artificial passages. Three further caverns of slightly smaller size were mapped in eastern Canada and these were interconnected by

many passages and smaller caverns of irregular outline.

"I see you lost your way," came the ironic voice of Talbot from the open doorway, startling them into turning abruptly.

"Yes," said Tony truthfully, "and we happened in here and have been greatly interested in this map."

"Rather surprising, isn't it?" asked Talbot, without anger.

"Indeed it is. Though you had told us of the size of Subterrania, we did not fully realize its true immensity. Why, this is a small world in itself."

"Exactly," agreed Talbot, "and it is going to play an important part in the future of the outside world. Would you two like to visit the quarters of the natives of Olaka now and see for yourselves how much has been done for them since Ainsworth and I took hold of things?"

"Oh, I think that would be very interesting," said Margaret, glad to agree to anything that would relieve the monotony of existence as a prisoner.

They were soon on a broad, paved area that fronted the building and extended to the shore of the tideless lake which it faced. The cold light of the five suns illuminated their surroundings with considerable brilliancy and with somewhat the same alteration of the color of their flesh and clothing as would be experienced in the light of mercury vapor lamps. Their five-fold shadows as they strode across the pavement were source of considerable amusement to Margaret as was the unfamiliar color of her ordinarily creamy-white skin.

"I'm glad we don't look like this always," she volunteered.

"You will," said Talbot, "whenever you are outside the main building. Our artificial lights inside are quite similar to the light of the sun, but all natural lighting in Subterrania is of the same nature as the five suns. There are practically no red rays in this light at all."

They had reached a broad roadway that led between an orderly double row of the curious circular huts of the natives. None of the natives were in evidence on the street.

"Were these huts built by the natives themselves?" asked Tony in astonishment at the regularity and smoothness of their size and shape.

"Yes," replied Talbot, "but only since our arrival here. When we came they lived in natural caves and passages branching off from the main caverns. But we taught them to build these huts and, since they can not originate an idea but only imitate, all of the huts are identical. You might think it peculiar that it should be necessary to provide any shelter whatever in Subterrania on account of the one great roof overhead. But it is very necessary. At the moment it is calm, but at times this realm is subject to quite as severe storms as those of the upper world. Electrical storms are not infrequent and these are terrifying in the extreme on account of the reverberations from the walls of the caverns. These are caused by discharges similar to lightning that take place between oppositely charged metallic deposits in the floors and walls. These are usually accompanied by severe rainstorms as well, since the humid atmosphere is brought to the saturation point by sudden changes in temperature and precipitation results. High winds are also produced by the electrical phenomena and by changes in temperature that cause the air to flow from one part of the realm to another."

Margaret glanced upward, startled at the sound of a strange whistling overhead. She gasped in astonishment at what she saw—a huge bat-like creature, with broad flapping wings fully twenty feet from tip to tip, winging its way out over the still lake. The eerie whistle was produced by this strange creature.

"Look!" she exclaimed.

The two men followed her glance, Tony with as much surprise as she herself evinced. Talbot laughed merrily at their astonishment.

"That is a pterosaur," he explained, "a species of flying lizard quite similar to those of the Mesozoic age on the surface. There are many other strange creatures of the same period still living their lives in this realm. We have even encountered plesiosaurs as large as fifty feet in length in the dense forests between the two great lakes. It is a wonderful country and I know you are going to like it—after you become acclimated, of course."

The Home of the Pithies

TWO or three of the Pithies had appeared at some little distance down the street and these stood gaping at the humans in open-mouthed curiosity. When they approached, the creatures did not move but continued to stare at the intruders from small beady, black eyes. They were quite similar to the apes that Margaret had seen in the zoo back home, yet they were infinitely more human and of quite erect posture. Their bodies were hairy and the foreheads long and sloping. The jaws were somewhat protuberant, and the expressions of their faces vacant, yet nowise hostile. In stature they were about five feet tall and the arms were somewhat longer than those of a human, yet not as long relatively as those of the ape. Their chests were deep and almost bare of hair, revealing a skin that appeared under the cold light as a gleaming blue-black.

"The lives of these Pithies," explained Jerry, "are very simple. Their needs are few and these are supplied by the females, who leave the city once every sixteen hours to hunt and to gather fruits and vegetables that grow in natural profusion along the shore of the lake. They are extremely fleet of foot and can easily overtake and capture with their hands the smaller lizard-like creatures that form their main supply of meat. They also lie quietly on the shore of the lake or along the bank of a small stream and fish, their quick hands darting into the water with incredible swiftness and returning with flopping prizes in the form of fish that

grow to a weight as great as fifteen pounds. The males are drones and are somewhat smaller than the females, who are the masters and rulers of their little families and clans."

"Was this city in existence before you came?" asked Tony.

"There was quite a settlement inhabiting the caves just back of this point. It was the largest settlement in the realm and we naturally located here. Then, when we had taught the Pithies to build their habitations, others came in great numbers and settled here to be near the strange new beings who could control life and death, who could make fire, and otherwise perform what were to them supernatural feats."

They had turned a corner and now advanced along a still wider thoroughfare where the huts were larger and more ornate. An air of greater dignity pervaded this street and they soon observed several of the Grimaldi lounging about in close proximity to their homes. These were similar to the higher type of ape-men who had assisted in their capture and, while of no greater size than the Pithies, they were still more erect and had much finer shaped heads and whiter skin. They were far less hairy and the sloping forehead and protruding chin was scarcely in evidence at all. Their eyes too held considerable more of intelligence.

After visiting several more streets of the city, the visitors tired of the adventure and did not object when Talbot suggested that they return to the castle, as he called the main large building. He was in unusually good humor and offered to show them the details of the psycho-transference work in which he and Ainsworth were engaged.

Margaret shuddered. "I could not bear to witness an operation," she objected.

"But these are entirely painless," Jerry explained, "The whole thing is done bloodlessly and both subjects are sleeping peacefully during the process. They have no realization of what is occurring and are in no pain whatsoever, even after they awaken."

"Oh, but I can't bear to think of the poor humans who must give up their intelligence to these manufactured giants and become morons like the one we saw in the second ward," she begged.

"These people are nothing to you," said Talbot, "They are not even your kind. Few of those who ride the subways are of the wealthy class who are your friends and associates. What difference does it make?"

Margaret was about to retort hotly and it was Tony's turn to interfere. He nudged her with his elbow and she refrained from further objection.

The Operation

THEY followed their captor into the castle and emerged a few minutes later from the car of the lift which had carried them to a floor of the building where the constant whir of high speed machines filled the air with pleasantly throbbing vibrations.

Into a spotlessly white laboratory they accompanied Talbot and he pointed out the many generators of the various energies used in the processes which achieved the horrible results they had already witnessed.

In an adjoining room there were twenty double operating tables and all of these were occupied. Margaret shivered with dread when she observed that the shroud-like coverings hid two figures on each table—one a giant and the other the figure of a man or woman from her own world. There was no sound save the faint whir of the machines in the laboratory.

They approached the nearest of the operating tables and saw that the heads of the two subjects projected from beneath the covers and that on each head there was a metallic cap-like contrivance that fitted closely to the entire portion of the skull in which the brains were enclosed. The patients lay face down so that it was not nearly as terrifying a sight as Margaret had expected. But the thought of the sinister purpose behind these unholy experiments held her in a chill of fear and disgust.

To the cap-like contrivances, there were connected a number of cables and these led to individual switchboards on the adjoining wall. These switchboards were covered with multitudes of small mechanisms that clicked and purred and reminded one of the central board of an automatic telephone system.

"The process takes about two hours," explained Jerry, "But in that time we are able to give our superman an education that would ordinarily require fifteen or twenty years to impart. You see, we have been able to develop the actual brain cells and convolutions of the Grimaldi along with the physical size and vigor of their bodies. Their brains are almost identical in construction with our own. but they are empty until we provide the knowledge from an outside source. It was discovered fully ten years ago that the nerve impulses of the human body are electrical. This was proved by means of the oscillograph. But it remained for Ainsworth and I to discover that all functionings of the cells comprising bones, tissue, nerves, blood and brain are likewise electrical or electro-chemical in nature. We learned how these functions can be controlled. We learned how to alter tissue, to promote the growth of the cells, to alter their nature completely and eventually how to transfer characteristics from one cell to another in a different location. That is how we are carrying the conscious and subconscious mental equipment from the human to the synthetic superman."

Margaret seemed about to swoon, so white and pallid had her features become. Tony bent over her in solicitation and was only diverted from his attention by the sudden appearance of Ainsworth who seemed to be in a state of great excitement.

"The supply plane is here," he jabbered, addressing Talbot as if he did not observe the presence of the visitors, "And Marron has a prisoner—a stowaway on the plane when they left the field on Long

Island. He seems to be a desperate character—but we can use him. Come."

Without reply Talbot followed. Margaret and Tony trailed along and were not requested to do otherwise. They returned to the paved yard before the castle and there saw a large airplane of the cabin type and capable of carrying a considerable load.

"Surely this large plane did not come through one of your tunnels?" asked Tony.

"No indeed," replied Talbot, "It came only from the entrance of the long tunnel of which I spoke. Our allies on the outside have planes of conventional design and these are used in obtaining material from all over the country above. But the loads are transferred twice, first to the car that brings them through the tunnel, then to this plane which completes the journey."

Two men of husky build were struggling alongside the plane with a third man whose clothing was torn to shreds and who fought and cursed with the fury of a madman.

"What have we here?" asked Talbot, when they neared the scene of the struggle.

"A stowaway, sir," replied one of the men holding the prisoner, who subsided at once on hearing the new voice, "We found him when only a few miles out of New York on the way back and thought we had better bring him along. He might have seen and heard too much."

"You did right, Marron," approved Talbot, "Let's get a look at him."

The prisoner raised his blood-streaked face in surely defiance. But when his eyes rested on Margaret he cried aloud.

"Margaret!" he exclaimed.

"Bob!" She leaned on Tony's arm and quaked in terror as she recognized in the battered man her brother, Bob Van Alstyne, the man whom Tony had seen on that seemingly long-ago night in Cartersville.

CHAPTER X

Rumblings of Insurrection

THE hours, the days that followed, were miserable ones to Margaret and increasingly hopeless ones for Tony. Charlie Frazee remained in confinement and Margaret's brother was also penned up in some unknown part of the castle. To Margaret's tearful entreaties, Talbot replied that Bob was in no danger and would come to no harm at his hands. To their inquiries concerning Charlie, he replied in the same manner. But he was rarely seen by the two prisoners who, though they were permitted more liberty about the castle and the city than they had hoped for, found that the time dragged very heavily on their hands.

Tony was religiously keeping his watch running and he marked off the days, those dragging stretches of twenty-four hours, on a note-book calendar he had been in the habit of carrying. When the days lengthened to a week and finally ten days had passed, he grew increasing fearful for Margaret's safety and his own. It seemed that Talbot was becoming more and more intolerant of their presence and, at the few times they saw him, he spoke to them in short, gruff monosyllables.

Then there came a night, or sleeping period, of horror when Margaret was awakened by terrible sounds of strife and agony from the corridor and was so unnerved that she pounded on the connecting door for admittance to Tony's quarters. For more than an hour she shivered in the darkness with Tony's protecting arms encircling her horror-shaken body as they listened to the screaming and cursing and groaning that told of a fearful conflict between the supermen and the morons in the hall. The strident voice and curses of Talbot and the screeching rage of Ainsworth told of their difficulty in regaining the mastery of which they had boasted. They had created Frankenstein monsters.

Long after the noises had subsided Margaret lay in the arms of the strong man she had come to know and trust so implicitly in the few days since their first meeting. Silently they sat and silently there came to each a great yearning for the love of the other.

"Margaret," finally burst from Tony in a husky, faltering voice, "I love you. I have always loved you it seems. If we ever get out of this place I want you for my wife. Can you—could you ever feel the same way?"

"Oh, I do, Tony," she whispered, "I have loved you since that first terrible night back home. If we could only return there how happy we would be."

She sobbed anew and buried her head in his shoulder. It was with a feeling of great tenderness and exultation mixed with the hopeless fear that had come during the past few days that he kissed her tear-moistened lips for the first time.

Revolt!

THERE came still another day when Talbot spoke cheerfully to the captives at meal time.

"Well," he said, "After that one insurrection things have been looking up considerably. But our raw material is entirely used up and we are planning an expedition against Chicago directly overhead. We need a couple of thousand new subjects."

"You mean," asked Tony, "that all of those kidnapped from New York have become morons?"

"All excepting those that Ainsworth did not consider fit to use and put out of the way."

"He killed them?"

"If you must call it that. They were merely removed by the simple fourth-dimensional process."

Margaret kept her eyes steadfastly on her plate but her food remained untasted after that. Tony lapsed into silence while Talbot held forth in the old optimistic and boastful vein. Ainsworth had not even appeared for this meal—evidently being too busily engaged in the preparations for the coming visitation of terror.

"May I visit my brother?" Margaret finally ventured.

"Why, yes," agreed Talbot, "I guess so. We'll go to his cell directly the meal is finished."

He was indeed in good humor and Margaret brightened considerably at his ready acquiescence.

But, when they reached Bob Van Alstyne's prison cell and she peered through the bars at his gaunt, drawn face, she once more felt the unnameable fear of this dreadful realm and of its menace to her brother and herself. Talbot stood by, watching and listening with little concern.

"Oh, Bob," she said, "Why did you do it?"

He shrugged his shoulders resignedly. "I thought they'd accuse me of father's murder and I wanted to get away while I could. I went out to the airport and stowed away on the first large plane that left. I got into—this."

A confused murmur reached their ears as they talked. This swelled to the sound of shouting and of fighting, running humans. Talbot straightened to attention and drew one of the bulb-shaped weapons from his pocket. The screeching voice of Ainsworth reached them and Jerry drew them back into a recess adjoining Bob's cell.

"They're coming this way?" he whispered.

Then came the limping figure of Ainsworth running through the corridor with full speed in their direction. The angry voices of his pursuers could be heard not far behind.

"God, Talbot!" gasped the panting Ainsworth, when he reached them, "They've found the arms we took from the militia. Rifles, revolvers and automatics are in their hands."

"Who? The morons?" asked Jerry.

"No—our supermen. And here they come! They've gone mad!"

He and Talbot drew back into the recess, with Margaret and Tony hidden behind them. When the first of the enraged giants came into view the weapons of the two scientists glowed into activity. There sprang forth two of the vicious, crackling blue flames and the very space about them groaned with the ensuing wrench. Four or five of the onrushing attackers vanished into thin air but there came from behind these the spiteful reports of a number of automatics. Ainsworth staggered and clutched at his skinny breast, bringing his hand away covered with blood. He choked and gurgled, then crumpled to the stone floor in a grotesque heap. Bullets and chips from the stone walls spattered all about them and Margaret cowered in Tony's arms. But Talbot stood his ground and again and again his weapon spat forth the blue flame that sent numbers of the enemy into that nothingness from which there could be no return.

When all of the pursuers had been accounted for, Talbot knelt over the prostrate form of his partner.

"He's dead," he pronounced gloomily. Then, with an arrogant gesture, "But I'll carry on. Our plans must not fail, and I, I alone, shall be master of the world!"

His eyes glittered with fanatical fire and Margaret dug her head still deeper into the protecting shoulder. Then Talbot was gone, speeding off in the direction from which the contestants had come.

In the ensuing silence a groan from the cell smote their ears as the despairing cry of a dying man. Margaret turned to the bars with a moan of foreboding.

"Bob! Bob!" she called piteously.

But Bob Van Alstyne was past aid or comfort. He lay on the floor of his cell, sprawled awkwardly in a pool of his own blood. A stray bullet had entered his prison and wounded him mortally.

"Guess I'm done for, Sis," he faltered, "Never was any good anyway. And now you'll have no more worries about me. Be better for you—for everybody. Tell—tell—"

The message was never finished, for Bob Van Alstyne breathed his last on that final word. Margaret stared at Tony in an agony of tearless sorrow. Then she knelt on the cold stone and bowed her head against the bars as closely to the body of her brother as possible.

Hope and Fear

TONY left her to her grief and tip-toed back to the scene of the recent struggle, where he picked up two automatic pistols where they had clattered to the floor when their recent possessors were "removed" by the strange weapons of the scientific exiles.

He likewise filled a pocket with loaded clips of cartridges with which the floor was strewn. Apparently the energy which made away with the living beings had not taken effect on the metallic weapons and ammunition, even as it had failed in the case of Van Alstyne's silk pyjamas.

A feeling of courage permeated his being as he returned to the mourning girl. They were at least not defenceless now and, if things came to the worst, they could always end their own lives rather than submit to what might even be more unendurable than death.

Gently he disengaged Margaret's hands from the iron bars they gripped so tightly. Gently he raised her to her feet and led her from the scene.

"Come dear," he said, "We can do nothing here and we may be able to save ourselves if we leave."

Unresisting, she followed, evidently too dazed with grief to protest. With one arm about her waist and with a loaded automatic in his free hand, Tony proceeded cautiously through the passages until they reached the lift. He had learned to manipulate its controls and they soon emerged at their own floor where all was in deep silence. He half carried the stumbling girl into his own quarters and tenderly assisted her to his own bed, where she lay prone with her head buried in a pillow. Then, with a pistol in hand, he took up his position at the door to await developments.

He had not long to wait, for there was the sound of a scuffle down the hall, then three shots in rapid succession and one of the supermen came staggering out of a doorway to fall in a heap on the

floor only a few doors from Tony's. Another followed, clasping a broad hand to his mid-section as he groped his way blindly from the room. With dragging steps and beseeching eyes he approached Tony.

Escape

THE magnificently-built creature was quite evidently on his last legs and a feeling of pity for this product of man's cruel ingenuity surged through Tony. He recognized the superman as the first one who had recovered from the psycho-transference process, the one addressed by Ainsworth as Gorth.

"Are you hit, Gorth?" he asked solicitously.

"Yes," was the painful reply, "Right through the middle. And how my head pains! It seems it has always pained since I became two beings."

"Two beings?" asked Tony, in surprise.

Gorth fell to his knees, then sat crouched against the wall rocking to and fro with arms about his stomach in a futile attempt to staunch the flow of blood and to relieve his pain.

"Yes," he said, "Two beings. The real Gorth, who is a manufactured man—produced by those fiends, Ainsworth and Talbot, from a less fortunate creature. Then the other me, a poor captive from that great land which is now in the memory that never before existed. This other self has been so unhappy—there was a wife, two children—wonderful companions—in that far-away land where all was so bright. And now the pain—the pain of longing that never ceases to tear at this great breast—the pain in the head that can not be relieved—the faces that come to torture in the darkness. I go—gladly—"

Another victim of Talbot's and Ainsworth's ambition had paid the price and Tony stepped into his room and obtained a sheet with which he covered the form of Gorth where it had slipped to the floor in its final struggle.

He returned to Margaret, closing and bolting the door behind him. She had recovered her poise and was sitting on the edge of the bed, a sad smile on her pale face.

Tony was about to make some attempt to console the girl he had come to love so intensely when there was a faint rap at the door, then a quick, insistent pounding.

"It is I—Talbot," came the voice of their captor, "Let me in!"

With pistol ready for any emergency Tony unbolted the door and Jerry Talbot literally fell into the room. He too was mortally wounded and Tony helped him to a large easy chair where he faced the two captives with something of sorrow in his dark eyes.

"Bring pen and ink—paper," he ordered, with a hint of his former imperious manner.

Tony did as he requested, placing the writing materials at Talbot's hand on the broad arm of the chair.

"Thanks," continued Jerry, "I'm about to write my last orders. And they are entirely to save you two people whom I have so wronged—your friend Charlie as well. I'll die a bit happier if I know that at least this much of my sin has been rectified. You can fly a plane?"

"Yes," replied Tony eagerly.

"Ours is in front, and it handles exactly the same as any standard plane with the exception of the atomic motor which is controlled by a small lever you will find at the side of the stick. But first—here are the keys."

He produced a bunch of keys which he handed to Tony, denoting the several that would be needed. He told them where to locate Charlie, how to reach the entrance of the long tunnel, how to operate the car that would carry them to the Arizona retreat, how to blow up the tunnel to forever close the entrance to Subterrania and seal the tomb of his blasted hopes with the monsters of his making. Then he swiftly penned an order to Marron, the leader of his band on the surface.

"This will see you safely through," he said, handing the paper to Tony, "Now, be off, before it is too late. The supermen and the morons are locked up temporarily, but none of our doors are strong enough to hold them for long and without my control they'll take things in their own hands. So make haste."

There was a certain majesty in the bearing of this man who, so recently inflamed with dreams of empire, was now about to pay the supreme penalty for his misdeeds. Tony hesitated.

"Is there nothing we can do for you?" he asked.

"Nothing. Leave me at once."

His head drooped and he waved them weakly from the room. Somehow they pitied him; a sense of loss came to them as they took their last look at the dejected figure of the dying man. They crept from the room and started for Charlie's cell.

CHAPTER XI

All's Well

WARD PLATT still nursed a broken leg sustained during the blast that wrecked the cavern beneath the subway tunnel. He was growing irritable from his confinement and sat grumpily before the screen of his television-radio with the plaster-encased limb propped up on a footstool. He watched disgustedly the mining operation pictured on the screen and listened disdainfully to the voices of the workmen as they labored with pick and shovel.

"Mary," he said, turning to his wife who sat reading only a few feet from him in their pleasant library, "This work the city is doing will get them nowhere. Our friends are irretrievably lost. This boring and digging has been going on for two weeks now and what have they found? Nothing. Charlie and the rest have been swallowed up in the depths of the earth. Hundreds of feet of rock have been penetrated in every direction from that cavern of disaster and there is no clue as to the whereabouts of the twelve hundred people who vanished."

He shook his head mournfully and his wife raised solemn eyes from her book.

"You think they will never be found?" she murmured. This had been gone over by them hundreds of times before but they never seemed to tire of discussing the mystery still in the minds of all of New York and of the rest of the world as well.

At that moment there was the flashing of a small light over the screen of the television instrument, indicating that a call for Platt's number was being made. He leaned over and pressed a small switch that dimmed the screen and opened the circuit for the incoming call. There was a brief pause, a click, and the screen re-lit to picture before the astonished eyes of Ward and Mary Platt the smiling face of Charlie Frazee.

"Hello folks," came his cheerful voice. And the two watchers paled as if they had seen a ghost.

"Why—why Charlie," gasped Ward, "We thought you were dead. Where are you?"

"Out in Arizona—just leaving for home. You can send out word that we are safe, three of us."

The smiling face of Tony Russell now entered the field of vision and with him was a beautiful blonde who Mary recognized as the missing Margaret Van Alstyne.

"And the others?" asked Ward.

"All dead—or worse," replied Charlie solemnly, "But it is a long story and must wait until we get back. We're coming by airplane at once."

There was very little further conversation since the adventurers were extremely anxious to start for home. When their faces faded from view, Ward Platt sat back in his chair with a gesture of futility.

"Well, it's beyond me," he said, "But from what they hint it seems that the world is going to be startled by a well-nigh incredible story. In the meantime we can be thankful that these three are safe at least."

"Oh yes," smiled his wife, "A thousand times yes. And you too, my dear."

And, far out over the desert lands of Arizona, there sped eastward a fast cabin plane that carried the three survivors homeward. Charlie sat with Marron, who was piloting the plane and glad to be getting away from his recent activities. Directly behind them were Tony and Margaret, hands intertwined as they gazed at the sun-lit countryside slipping away beneath them and spoke in whispers of the new life to come, when they would always be together in the land which was forever freed of the menace from below.

THE END

What Is Your Knowledge of Science?

Test Yourself by This Questionnaire

1. What is the difference in the life of the Queen and the worker bees? (Page 135).
2. Why did the nobles of Gobi not realize that their bones were being decomposed? (Page 139).
3. How could one arrange from a central point to follow visually the progress of a train? (Page 149).
4. By what principle could a cable-less elevator be operated? (Page 153).
5. How does the temperature change as one descends from the surface into the earth? (Page 154-55).
6. How is it possible to determine the point at which a radio transmitter is located? (Page 103).
7. What are the chemical compositions of diamonds, sapphires and rubies? In what kind of soil would they be found? (Page 112).
8. How can one determine the conductivity of a liquid? (Page 114).
9. Why might remaining in a "weightless" condition for some time prove physically harmful? (Page 170).
10. Why could not one take a bath in a tub in a space flyer in "free space"? (Page 173).
11. How could one gather and hold sufficient heat for life in a building in free space? (Page 176).
12. What accounts for the value of arrows as a missile in warfare? (Page 124).
13. What is the great advantage in modern warfare of attacking large cities? (Page 124).
14. What is the propulsion principle of the "rocket" ship? (Page 119).

The Problems of Space Flying

By

CAPTAIN HERMANN NOORDUNG, A.D., M.E.,
(BERLIN)

Translated from the German By Francis M. Currier

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THE editor is happy to announce that we have secured the American translations rights for this important new work of Captain Noordung, well-known German engineer and authority on mechanics.

It is, we believe, the first serious work of its kind that has appeared in print, where an authority takes the problem of space flying seriously. This may be considered the most important advance step in the art of space flying because once serious-minded engineers devote their time and risk their reputations in the writing of text books on the subject, we may be sure that the translation of a former "pipe dream" into an actuality is not far away.

There is much contained in Captain Noordung's book which we have deemed wise not to include, because it goes into the realms of higher and intricate mathematics, of interest only to the engineering fraternity and mathematicians.

Captain Noordung has also considered the technicalities of the space rocket; as well as its mathematical considerations. His conclusions are, that if sufficient capital is available for building a rocket to travel into space, that it will be possible now to build one. And it seems certain that sooner or later, such a rocket will be built for exploration purposes.

In the present articles, we are mainly concerned with the more popular parts of Captain Noordung's book, which, in easy stages, acquaints the reader with the mysteries of free space, in a way that never has been done before.

In the first installment, will be found a tremendous amount of new material, which has never appeared in print.

In the second installment there will be found Captain Noordung's own description of an epoch making invention—his sun power plant, his floating observatory and his space living quarters, as well as a number of other important inventions, all of which are based on excellent science and mathematics, and which sooner or later, will be translated into actuality.

We know that every reader of SCIENCE WONDER STORIES *will be highly interested in Captain Noordung's book.*

In starting his subject Captain Noordung first considers whether we humans have a constitution enabling us to live in the strange and terrible conditions of "empty space." He attacks his subject by first considering the influence on us of "weightlessness"—the condition in empty space where there is no gravity and no weight.

PART I

The Influence of Weightlessness On The Human System

HOW does the absence of weight affect the human system? Experience in the case of a fall (such as falling in a parachute) shows that the condition of weightlessness during the fall, lasting a short time, is not injurious to health. Whether this would also be the case with lasting weightlessless cannot be foretold with certainty, since nobody has ever experienced such a thing. Yet we may most probably assume it, at least so far as its effect on our body alone are concerned; for all the physical functions result from muscular or osmotic forces and consequently do not require the assistance of gravity. In fact all the processes important to life prove to be wholly independent of the position of the body and are performed equally well in an erect or lying position or indeed any other.

Only by remaining in a weightless condition for a long time might a certain injury result. And this would be due to the fact that important groups of muscles would atrophy from disuse and would therefore refuse their services when life should return to normal conditions (for instance, after the return to the earth). It is however probable that by systematic exercises this could be successfully provided for, quite aside from the fact that it would be likewise possible to meet this circumstance by proper technical arrangements, as we shall see later.

Presumably the only organ influenced by the absence of weight is the organ of equilibrium in the inner ear. And even this would no longer be needed as before; for the idea of equilibrium ceases to exist in the absence of weight. In every position of the body we then have the same feeling; "up" and "down" lose their usual significance with regard to the surroundings; the floor, ceiling, and walls of a room may each be considered as merely a wall.

The impression of these very unusual conditions might indeed, especially at first, produce a serious mental injury however. There is also the influence directly exerted on the nervous system by the ab-

sence of weight. The chief sense-impressions involved are as follows: the effect already mentioned on the organ of equilibrium, the feeling that there is no longer a supporting pressure against the body, and certain changes in the sensations of the muscles and joints.

Now this complexity of feeling is thus far known to us on earth only when we fall, since (as has been pointed out) here on earth we can only experience weightlessness in falling. Therefore in space we shall feel, with the ceasing of weight, the same anxiety that is connected with falling, as well as all the other mental states caused by this extraordinary situation. And this is true even though the absence of weight is not caused by falling but is caused in other ways (as for example in the space flyer through centrifugal force to be described later.)

Certainly it is to be expected from previous experience (of such persons as aviators, ski-jumpers, etc.) that through habit it will be possible to endure weightlessness even in its mental relations, more and more as one realizes that "weightlessness" and "falling" need not be connected. It may even be assumed that the feeling of worry may be entirely eliminated by a gradual diminution of the feeling of weight.

The German scientist Oberth has made a deep study of all these questions. Using his results, we may summarize as follows: though the absence of weight may be endured for a long and maybe infinite time without serious physical injury, this cannot be stated with certainty regarding mental effects, but it may be considered probable, at least. The course of mental impressions is presumably approximately as follows: first, a feeling of worry (at least in the case of rapid and direct entrance into weightlessness); the brain and the sense organs act extremely intensively, all thoughts being strictly objective and both quick and logical; time seems to pass more slowly; then there sets in a peculiar lack of sensitiveness to pain and discomfort. Later these phenomena grow less and there remains only a certain feeling of increased buoyancy and freshness, perhaps as after taking a drug which stimulates the nerves, until at last after long habituation the mental condition also becomes entirely normal.

CHAPTER II

The Physical Behavior of Bodies In The Absence Of Weight.

TO be able to form an idea of the general physical relations prevailing in the obsence of weight, one must remember this: the force of gravity of the earth, which draws all masses down to the ground and thus "arranges" them with a certain regularity, is no longer effective. Therefore bodies move in their accidental course, following only the law of inertia, in an absolutely straight line, until some resistance stops them. They "arrange" themselves, therefore, only according to the forces operating between them, in them, and actually pertaining to them (molecular, electric, and magnetic force, mass attraction, etc.)

As a result of these extraordinary suppositions we must conclude that all bodies unaffected by gravity show an entirely different behavior and that our own acts in consequence must be performed in a manner entirely unlike that used hitherto.

Thus human locomotion can no longer take place by "walking." The feet have lost their usual purpose. In the absence of the pressure of weight there is no friction under the soles of the shoes. Therefore they stick to the floor much less than they normally stick even to the smoothest ice. To proceed ahead one must either pull one's self along a surface by the hands, for which purpose the walls of a space flyer must be provided so far as possible with proper holds (presumably straps like those in street cars), or else it is necessary to jump in the direction of the goal or to float to it.

At the same time it may be hard for the novice to conserve his strength properly. This is however necessary. Since a person strikes the opposite wall of the room with the full force of the initial push, too much zeal in this will lead to painful bruises.

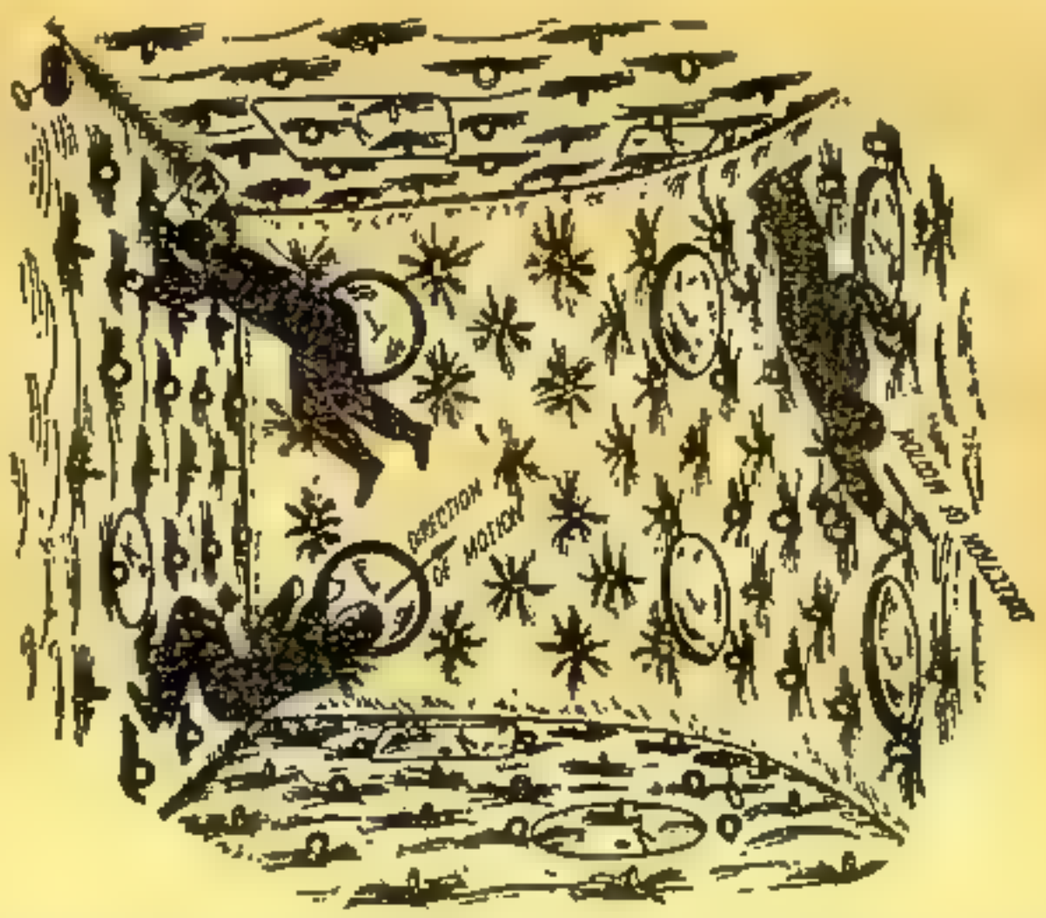

Fig. 1—A room in the observatory in space, in which weightlessness prevails and which is equipped accordingly. The walls are completely padded and provided with hand-holds No loose object is present. K—Boxes with fastenings for keeping utensils, etc. L—Windows to admit the light. O—Openings for the conduction of air. Z—Motion by pulling along. A—Motion by pushing off.

Therefore all the rooms used by persons, more especially in the corners and on all sharp edges, must be very well padded.

Motion by pushing can also be dangerous to life, especially if it occurs in the open, that is to say outside the observatory, (to be described later). For if one in jumping fails to take proper precautions and misses the goal, the result will be continuous and eternal travel in the deadly emptiness of space. Thus, there threatens as a counterpart to the terrestrial danger of falling of from a height the no less terrible possibility of floating away into open space. The cry of "Man overboard!" on a space flyer has its meaning even in the absence of weight, though certainly in a different sense than on earth.

Bodies Inside a Room

SINCE bodies now cannot be pressed on their supports by their weight, it is of course useless to "hang up" or "lay down" an object anywhere. It would have to be guided to its support or held by magnetism or some other forces. A body can be kept in position only if it is fastened somewhere or still better if it is shut up. Therefore the rooms of the space flyer must be fitted out with easily fastened boxes suitably placed about the walls.

Clothes racks, stands, etc., likewise tables, at least for laying objects down, become useless pieces of furniture. But also seats, benches, and beds can no longer fulfill their purpose; a person would have to tie himself to them in order not to float away from them into some corner at the least movement. Without weight there is neither "standing," "sitting," nor "lying down." To do any work it is necessary to be fastened to the site of activity: for instance, to the table, if desirous of writing or drawing. Sleeping does not require lying down: it is possible to rest in any position, in any part of the room.

But in spite of this irregularity in the behavior of freely movable bodies caused by the absence of weight, the manner in which they come to rest is not absolutely arbitrary. The general law of mass attraction is valid even in the observatory in

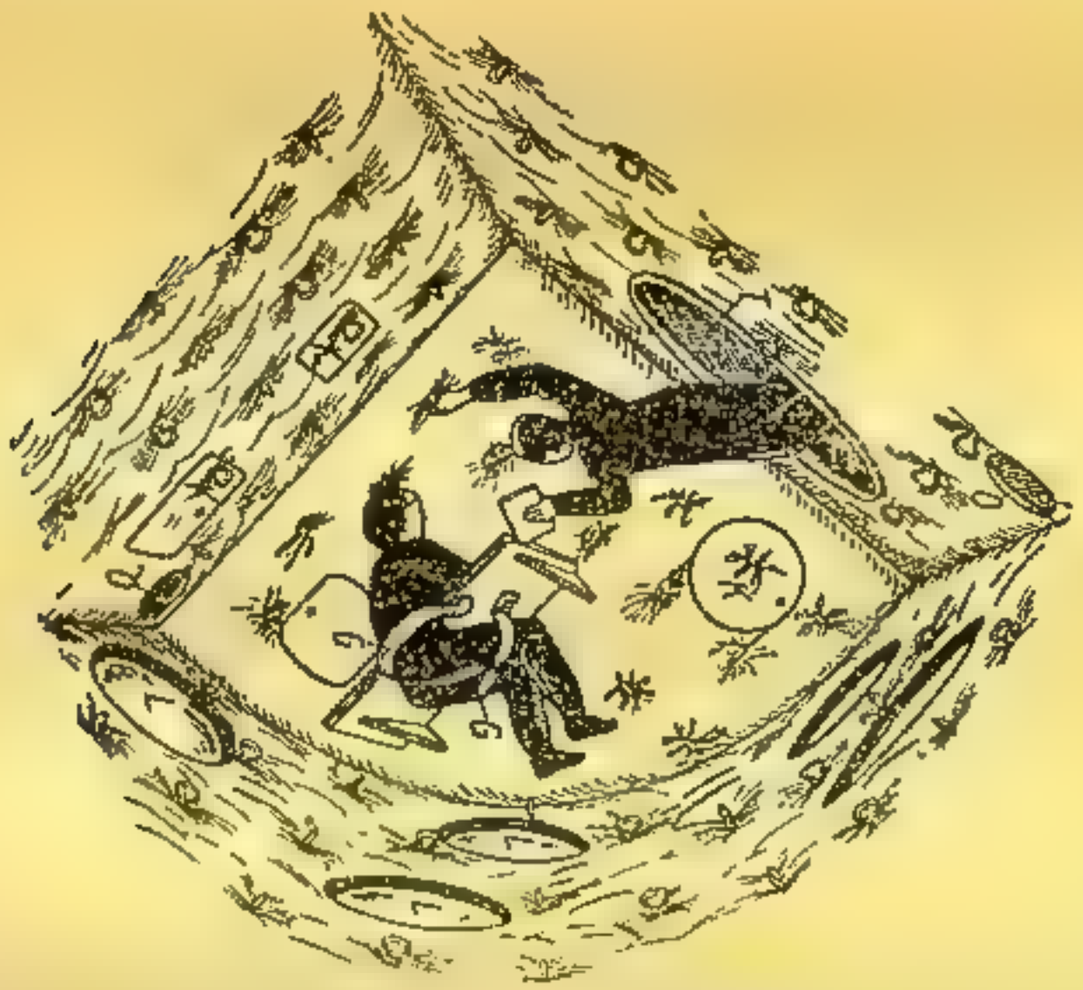

Fig. 2—Arrangement for writing in a weightless condition. One must be fastened to the table with belts, etc., to be able to remain at it without holding on. Through the round door a man is floating in from the next room, bringing some object.

space, and it causes all masses to be attracted toward the common centre of gravity. Because of the comparative smallness of the total mass however this takes place with a very small acceleration, so that travelling only a meter without any other means of propulsion takes hours. But at last the bodies which are not fastened down, following this force or their own accidental motion, will meet on one of the walls and either remain there or, if their speed was great enough, float back and forth between the walls, constantly repelled according to the degree of elasticity, until their energy of motion is gradually exhausted and they come to rest at one of the walls. Thus, in the course of time, all bodies freely floating within the limits of the space flyer will settle at the walls and particularly as near as possible to the common centre of gravity.

Since this process however may extend over

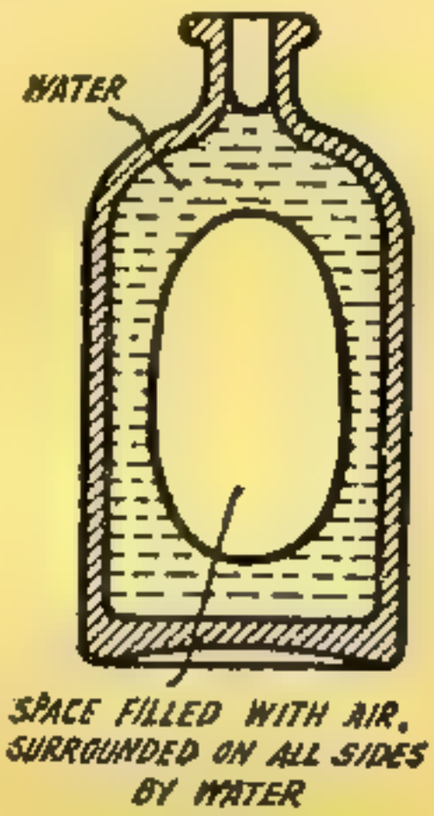

FIG. 3

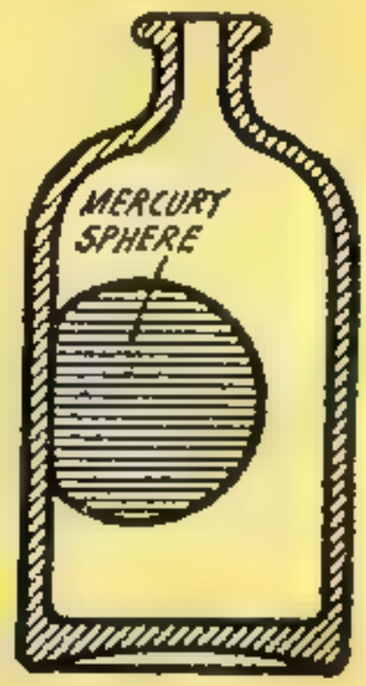

FIG. 4

Fig. 3—How water spreads out in a partly filled bottle in the absence of weight.

Fig. 4—Behavior of mercury in a bottle, in the absence of weight.

hours or even days and since even a weak current of air would suffice to disturb it or to dislodge and mix up again the bodies already come to rest (but clinging only very loosely to the walls), from a practical standpoint there is really no regularity in the motion of the weightless masses.

This last point becomes noticeable in an especially unpleasant manner when it is a question of bodies which get into a room in considerable numbers. If these are powdery, they can be collected and removed in a comparatively simple manner by filtering the air through vacuum cleaners or similar devices. But if they are somewhat larger, for instance if anyone thoughtlessly emptied a bag of apples in a room, there would be no other method than catching them in nets. In fact, all bodies must be very well cared for; the arranging power of weight has ceased to operate: *matter is free.*

The articles of clothing also go on a strike; for they no longer hang down, even if made of the heaviest fabric. Therefore cloaks, dresses, aprons, and the like are useless as clothing. At any movement of the body they would flow quite irregularly in all directions.

In the weightless condition, the behavior of liquids is especially peculiar. Under normal conditions, following the force of gravity, they of course seek the deepest places and then fit themselves completely into whatever holds them (the vessel, the ground, etc.). But when there is no weight, the separate particles can follow their molecular forces unhindered and arrange themselves according to the effect of the latter.

The Behavior of Liquids

LIQUIDS in a weightless condition therefore take on an independent form, indeed the simplest form known to geometry, the sphere. This

requires the assumption that they are subject only to their own force of cohesion, that is to say, that they touch no body which they can "wet."

It is now clear why water, in falling, forms exactly in drops: for in this condition, as was said before, it is weightless and therefore takes on a spherical form, which the resistance of the air distorts into elongated drops.

If the liquid is in contact with a body which it

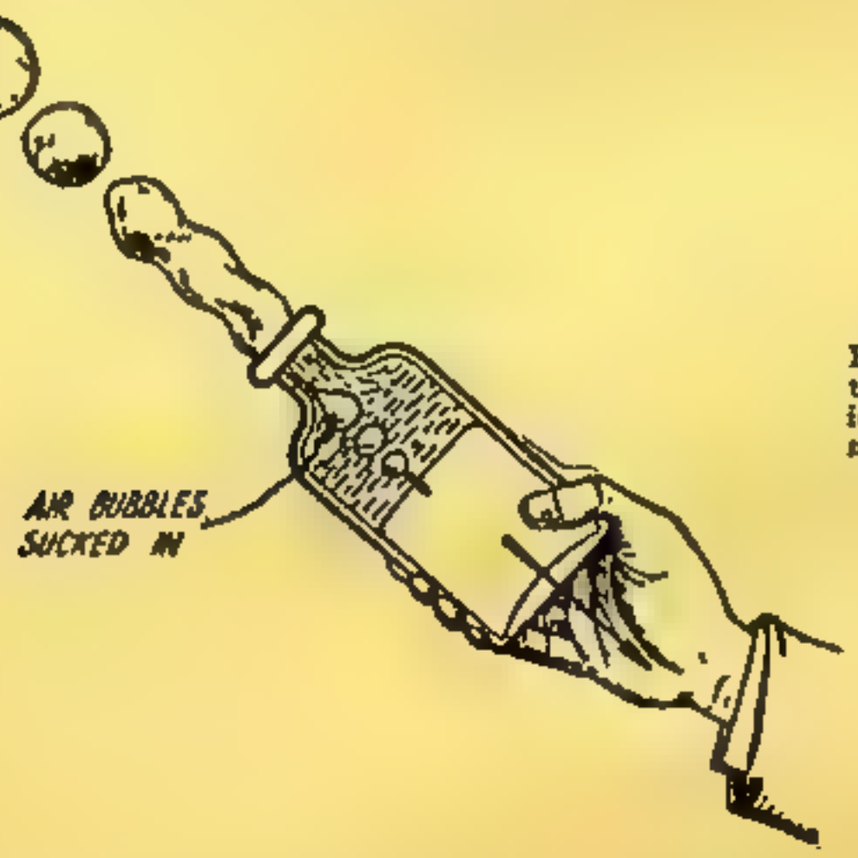

Fig. 5—Emptying a bottle in weightlessness by pulling back.

wets, besides the forces of cohesion (the tendency of the particles of water to cling together) there are also forces of adhesion (the tendency of the water to cling to a surface that it "wets") of much greater power. The liquid will then be inclined to follow the latter and to spread out over the surface of the body, in other words to cover it with a more or less thick layer.

Accordingly, in space, for example the water in a partly filled bottle will not occupy the bottom of it but, leaving the centre empty, will seek to spread out over all the walls of the vessel. Mercury, on the other hand, which does not wet glass, forms in a ball and remains floating in the vessel.

In both cases it makes absolutely no difference in what position the bottle is held. Therefore it cannot be emptied in the usual manner by simply tipping it. For this purpose it is necessary to do one of the following things: either pull it back quickly (that is, accelerate it backward); or push it forward in the direction of its mouth and suddenly check it (that is, retard the forward motion); or lastly swing it in a circle.

In these cases the liquid will come out of the bottle because of its force of inertia (in the last instance because of the centrifugal force), while the air is sucked in at the same time, just as in the gurgling in the normal pouring from a bottle. It must be assumed that the neck of the bottle is sufficiently wide or that the motion takes place with sufficient force so that the entrance of air can actually take place while the water is streaming out.

It is interesting to note that the above described method of emptying a bottle by pulling it back or stopping it, there being no weight, is fundamentally no different from the pouring out by turning the bottle upside down in the case of the normal condition of weight on earth. Indeed, from a physical standpoint, these processes are absolutely identical, if the motion of pulling back or stopping is exactly the speed of the acceleration of gravity (with us, 9.81 meters a second); for according to the general theory of relativity it is well known that a system in accelerated or retarded motion is exactly equivalent to a field of gravity of the same acceleration. We can therefore say that in the process of emptying I have described, there comes to replace the missing gravity those forces of mass inertia which were brought to life in the system of bottle plus contents by the pulling back or stopping.

After coming out of the bottle the liquid will float off in the room in the form of one or more spheres, similar in appearance perhaps to soap-bubbles moving through the air. Finally such floating spheres of liquid must strike one of the walls.

If they can wet it, they will seek to spread out over it.

Otherwise a sphere will be broken up by the shock, like a falling drop of mercury, into numerous smaller spheres which will float along the walls or sometimes perhaps out in the room, sometimes joining again and breaking up, until their force is finally exhausted and the entire amount of liquid comes to rest, united into one or more spheres remaining on the walls. (Compare the previous remarks regarding processes taking place in a bottle).

In view of this unusual behavior of liquids it is impossible to use any of the ordinary vessels, such

Fig. 6—Swinging a water bottle in a circle to empty it in the absence of weight. (In reality the liquid coming out would not distribute itself so equally on the indicated curve of flowing out.)

as bottles, drinking glasses, sauce pans, jugs, wash basins, etc. In fact it would be hardly possible to fill them. But even if this could be done, for example if a bath were prepared, we could not use it; *in a very short time the water would disappoint us by spreading from the tub to the walls of the room or by settling on them in spheres.*

For holding liquids, the only suitable devices would be tubes or balloons made of rubber, with

some sort of stop-cock, or vessels with a bottom moving like a piston, similar to a squirt-gun; for only such can be filled in a simple manner and conveniently emptied. This last is accomplished by squeezing them or by pushing the plunger, to force out the contents. In the case of elastic balloons filled so as to expand the covering, the tension of the latter alone would suffice to expel the liquid on the opening of the stop-cock.

Cooking and Eating

SUCH compressible vessels (provided with a suitable mouthpiece) would have to be used for drinking, instead of the useless vessels of ordinary life.

Furthermore the different implements used in eating, such as plates, dishes, spoons, etc., would

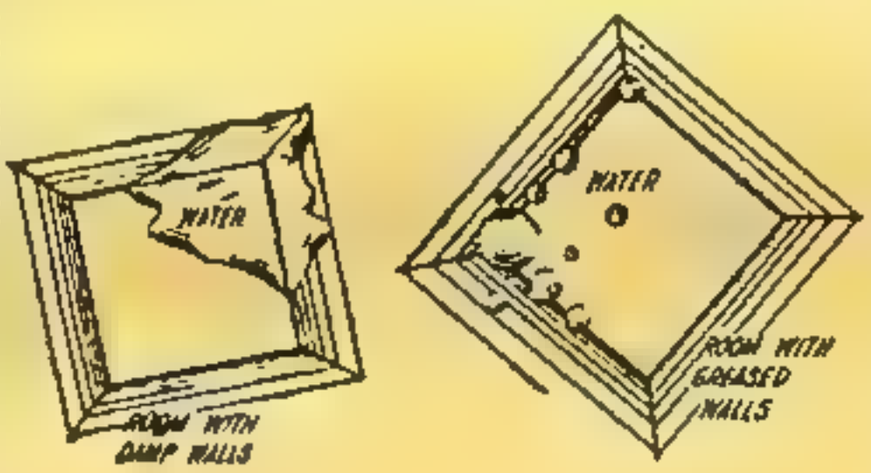

Fig. 7—In the absence of weight water released in a room with walls it can wet well (e.g. rather damp ones) would spread out over them, as shown at the left; in a room with walls it cannot wet (e.g. greased ones) it would collect in spheres and rest by the walls, as shown at the right.

be worthless. One careless movement, and we would have to chase their perhaps precious contents, which would be floating through the room. Eating would be possible in only two ways, either by consuming the food in solid form like bread or by drinking it in liquid or semi-liquid condition by means of the compressible vessels just mentioned. The cook accordingly would have to prepare the food in these ways.

And assuredly the cook would have particularly great difficulties to overcome in his important work. Even these, however, could be conquered. Thus, for example, electric cooking vessels with locks could be used, to be kept in constant rotation during use, so that the centrifugal force thus produced would replace the missing gravity and press the contents against the walls of the vessels—and there are other similar devices. At any rate, the cooking would be very inconvenient, but this as well as eating and drinking would be possible in some manner.

It would be absolutely necessary to give up washing or bathing in the usual manner! Cleaning could be done only by rubbing with damp cloths, sponges, and the like, rubbed with soap in case of need, however satisfactory or not this way might be.

The more closely we regard the matter, the more clearly we must recognize that *it is far from an unalloyed pleasure to be able to float about like an angel,* freed of all burdensome weight—even if we ourselves find this condition pleasant. For weight does not simply hold us down, it forces down all other bodies as well and keeps them from moving about in confusion, without any regularity, if chance has set them free. The force of gravity is perhaps the most important power for order in our existence. Where it is absent, everything is, in the truest sense of the words, upside down, and has lost its hold.

CHAPTER III

The Necessity of Readjustment

HUMAN life can exist only in the presence of properly composed gaseous air. In the first place, the process of living is a process of combustion and therefore requires for its continuance a constant source of oxygen, which the human system can only take up by breathing from gaseous air. Secondly, the human body must always be surrounded by a certain pressure, for without it, our water content would evaporate and the vessels of our bodies would burst. It is therefore necessary to provide for the artificial preparation of air, if our life is to be made possible in empty space.

To accomplish this the human beings in space must always be surrounded by a room of some sort shut in on all sides and absolutely air-tight, since only in such an arrangement can the air be kept at the proper pressure and in the proper composition. This must be done by artificial means and actually can be done by automatic devices.

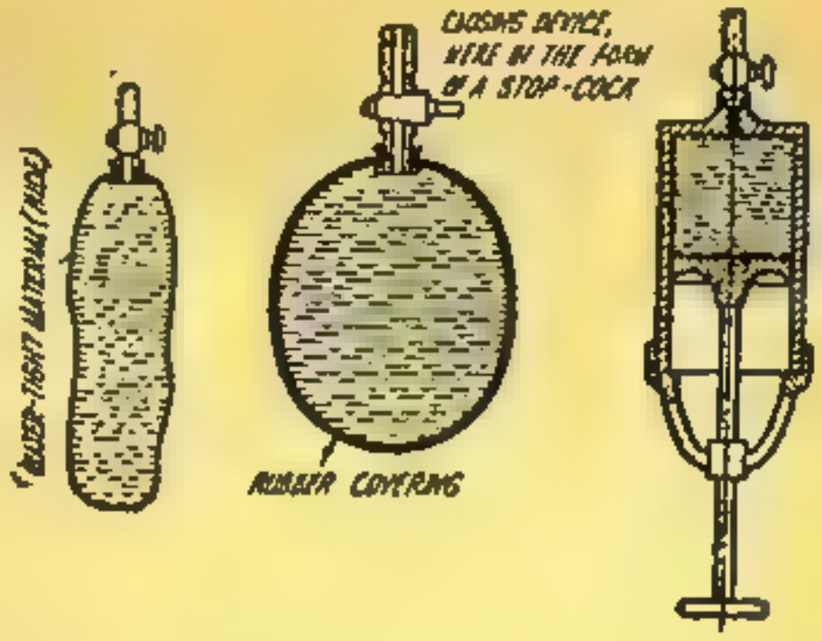

Fig. 8—In the absence of weight the usual vessels for liquids must be replaced by sealable tubes (left), rubber balloons (centre), or vessels like squirt guns (right).

In substance it is a question of nothing but a rather large enclosed space, ranging in size from a room to a group of whole buildings, such as might be needed for a rather long sojourn. The walls would have to be built on the principle of a steam boiler, since they must resist an interior air pressure of one atmosphere (14.7 lbs. per square inch) in excess of the empty space outside. They should therefore not only have the requisite thickness but should also present so far as possible only curved surfaces, since flat ones need a special strengthening or reinforcing on account of the pressure. The nitrogen and especially the oxygen needed for the artificial preparation of air would have to be kept on hand in large quantities in special tanks in a liquid condition and be continually replaced from the earth.

To be able to remain *outside* such enclosed rooms in space, one would have to use an air-tight suit, the

inside of which is automatically provided with air by an apparatus carried along. The devices, that is, would be somewhat like the well-known diving

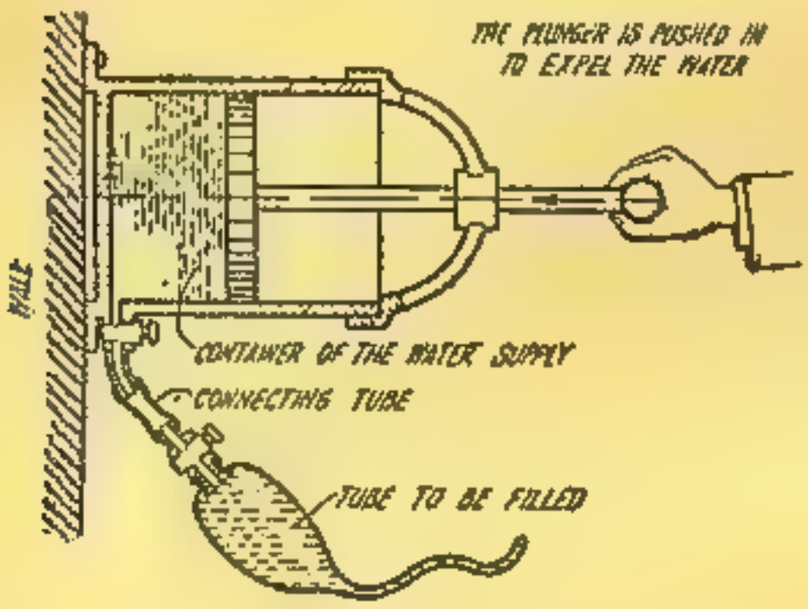

Fig. 9—Filling a water container in weightlessness.

suits used under water. More details about these will be given later.

It is clear that the problem at hand concerns much the same things as remaining under water, in submarines and in diving. On the basis of ample experience already collected in the matter of artificial production of air we may say that this question is completely answerable, beyond a doubt, for a sojourn in space.

Eternal Silence Prevails in Space

THE air has not merely a direct importance for life, (for breathing and the production of a suitable pressure) indirectly it also has the greatest significance, since it influences the natural phenomena most important for the development of life—heat, light, and sound—in the highest degree.

Sound is a vibratory process of the air and can never occur in a vacuum. Therefore eternal silence prevails in space. The firing of the heaviest cannon could not be heard, even at the slightest distance. Likewise normal communication by speech would be impossible. Of course this is not true of enclosed, air-filled rooms, within which the properties of the air can be artificially maintained as on

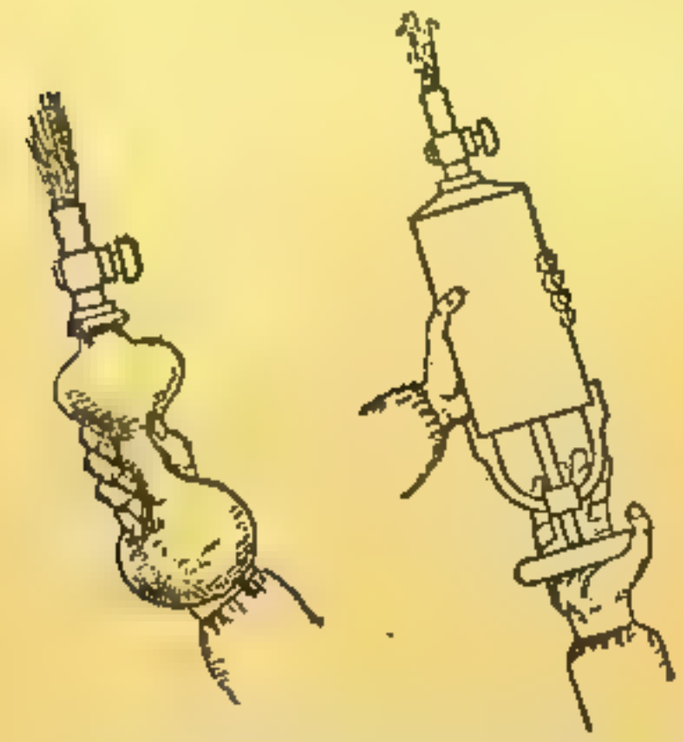

Fig. 10—Emptying a liquid container in the absence of weight can be done satisfactorily only by squeezing out or pressing out the contents.

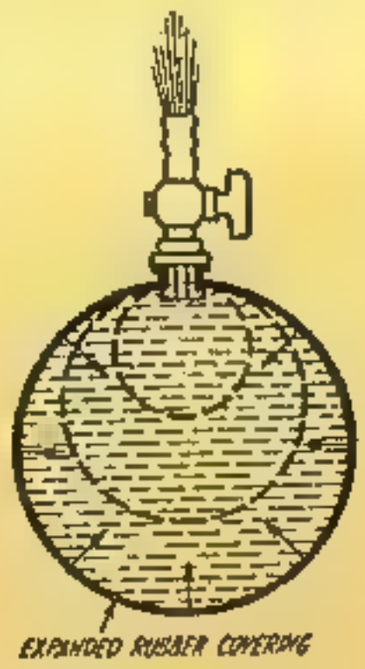

Fig. 11—In elastic rubber balloons filled under pressure the contents flow out themselves when the stop-cock is opened.

earth. But it is true when one is out "in the open" (in the space suit). There, communication by speech would be possible only by telephonic means.

Sunshine in the Darkness of Night

LIKEWISE the conditions of light are now essentially altered. Naturally the idea of day is connected with the notion of a blue sky or illuminated clouds and of light diverging in all directions, without the necessity of direct sunshine to produce them. But all these phenomena are simply a consequence of the presence of the earth's layer of air. In this, a part of the sun's rays is divided, repelled, and thereby diverged in all directions, producing at the same time the impression of the blue coloring of the sky. Thus the air provides a manifold and beneficial gradation between the brilliance of sunlight and darkness.

In space all this is not possible because air is lacking there. At the same time there is an end to the idea of day, taken in the strict sense of the word. The firmament at all times appears in deepest black, out of which the countless stars shine extraordinarily brilliantly with an even calm light, while the indescribably blinding power of the sun far surpasses everything else.

Yet, once we turn our backs to the sun, we have the impression of night, though our backs are flooded with its light; while under its rays the side of a body turned toward it (consider, for example, an umbrella) shines brilliantly, on the side turned away the darkness of night prevails. Not absolute darkness! On all sides the stars are shining, even if the earth or moon do not light up by their

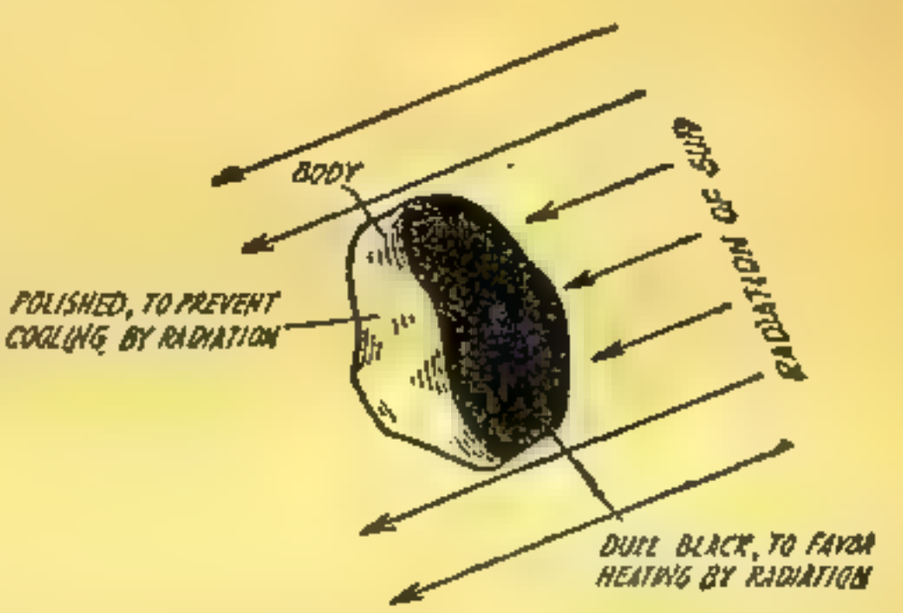

Fig. 12—Warming a body in space by the sun's rays by proper choice of surface conditions.

reflected light the side of the body lying in the sun's shadow. Still the light that is obtained is always harsh and direct light, never mild and diverging as on earth.

Unlimited Vision

IN many respects, however, the absence of air has advantages for the conditions of visibility in space. It is indeed generally known what a great influence the composition of the air exercises on distant vision (e.g. in the mountains, on the ocean, etc.). Even on clear days some of the light rays are always lost in it, or, because of the tiny particles of dust and vapor always floating in it, vision is obscured.

This last circumstance is very disadvantageous on earth, for the carrying out of distant observations of all kinds, especially in astronomy. Therefore observatories are erected whenever possible on

high points on mountains, because at such points the air is relatively the clearest. But even then the limitations are soon reached. It is not possible on earth to keep the fixed stars from twinkling, (which is caused by nothing but the presence of our air). Similarly it is not possible to eliminate the diverging sunlight (the blue of the sky), caused also by the layer of air and very troublesome for

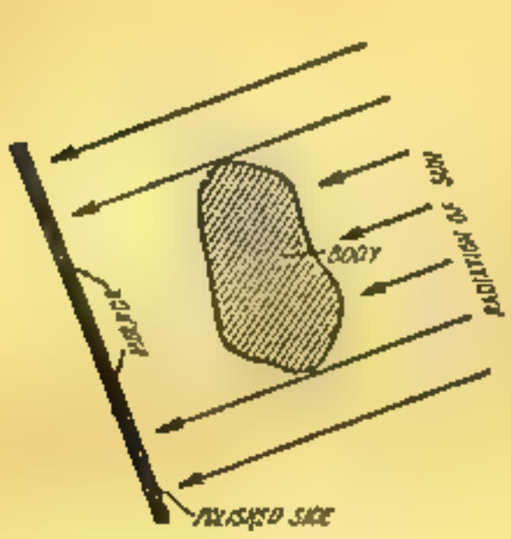

Fig. 13—Heating a body by shielding its shady side against space by means of a mirror.

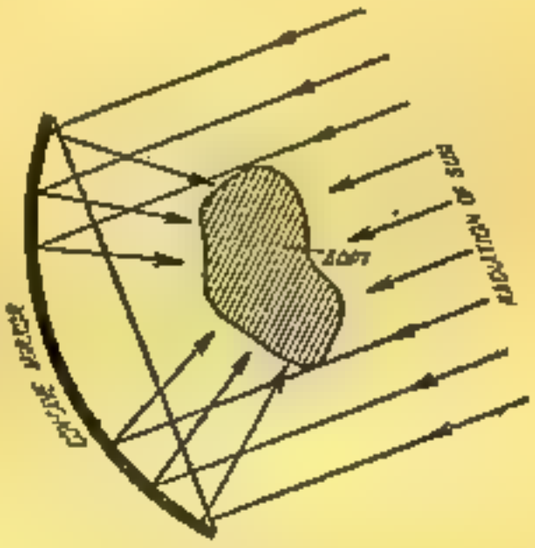

Fig. 14—Powerful heating of a body by concentrating the sun's rays on it by a concave mirror.

observations during the day. This latter difficulty greatly impedes the study of such heavenly bodies as are not visible in absolute night, such as Mercury, and Venus, and by no means lastly the sun itself.

All these disadvantageous circumstances cease in the empty space of the universe: nothing now weakens the luminosity of the heavenly bodies, the fixed stars no longer twinkle, observations are not impeded by the blue of the sky. At any time, equally favorable and practically limitless possibilities are offered; for now that there is no optical hindrance, we could use telescopes of as great a size as we desire.

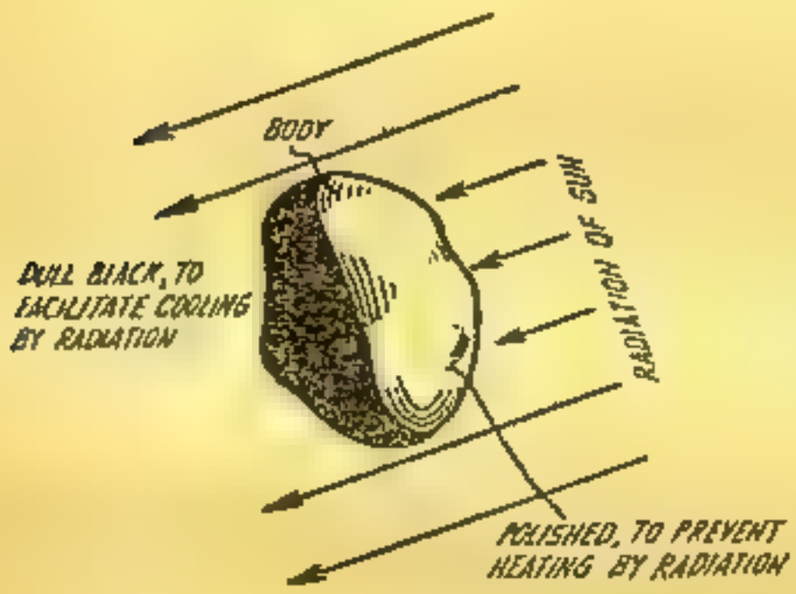

Fig. 15—Cooling a body in space by proper choice of surface conditions.

Heatless

ESPECIALLY significant is the influence exerted by the absence of air on the heat conditions of empty space. Since heat, as is known today, is nothing but a definite condition of motion of the smallest material particles of which the substance of the body is formed, this presupposes that there is no heat unless some matter is present. Where there is none, there can therefore be no heat: from a practical standpoint space is "heatless," because there is no air. Whether this is also absolutely correct theoretically depends on the accuracy of the widely held opinion that space is filled with real matter, even though divided extremely finely. If space is absolutely empty of material, the idea of temperature accordingly loses its significance.

This view does not contradict the fact that the heat rays of the sun and of the various fixed stars traverse space in tremendous quantity: *for heat rays themselves are not heat!* They are nothing but electromagnetic waves of the same kind as light waves or radio waves; they have, however, the special characteristic of being able to produce that molecular motion which we call heat, *when they strike anything material.* This occurs only when they are taken up (that is, destroyed) by the matter in question, for only in this case does their energy pass over to the body and transform into heat.*

Thus the temperatures of transparent or highly polished bodies are raised only a little even with strong heat radiation and appear almost insensitive to heat rays. For in the case of transparent bodies the rays for the most part pass through the body, in the case of polished bodies the rays are repelled.

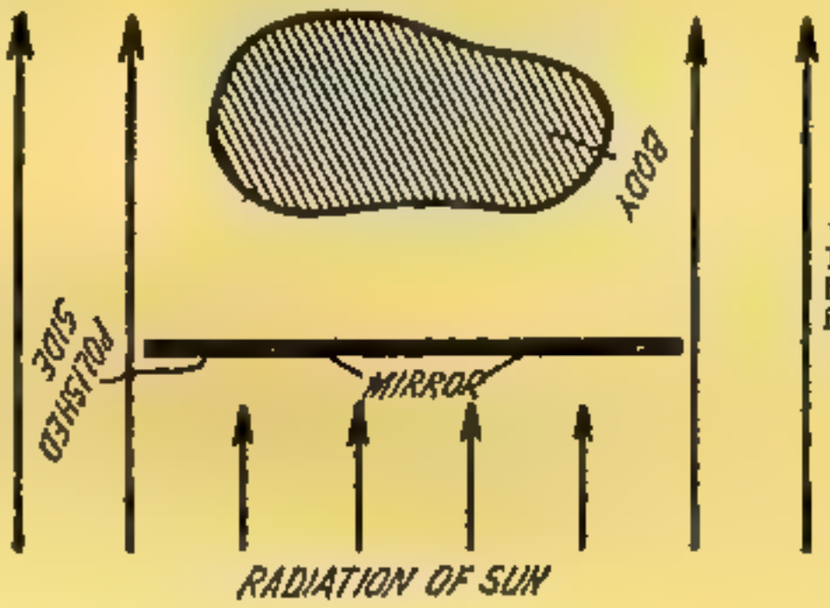

Fig. 16 — Cooling a body by shielding it from the sun's rays by a mirror.

In either case the rays are not weakened or destroyed, therefore they do not give up any of their energy. On the contrary, if the surface of the body is dark and rough, it can neither allow the rays which strike it to pass through nor reflect them; in this case they must be taken up and cause therefore the heating of the body.

This phenomenon, however, holds, not only for the reception of heat, but also for emitting it by radiation: the brighter and more polished the surface of a body is, the less its power of radiation, therefore the longer it retains its heat; with a dark rough surface it can cool off very rapidly by radiation.

The processes of heat radiation of different types occur chiefly on dull black surfaces and least on bright polished ones. This circumstance would make it possible to influence the temperature of bodies in space at will, simply and extensively.

If an object in space is to be heated, the side toward the sun is made dull black and the opposite side bright and polished; or the shady side (the side away from the sun) is screened from space by

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** What Mr. Noordung means in this paragraph is that space cannot of itself hold heat (as our air does) because space has no material in it which can transmit the molecular action (there is nothing to be heated). But heat can be transferred across space from the sun or a star to a material body by heat waves—Editor.*

means of a mirror. If a concave mirror is used for this purpose (concave to the sun), which directs the sun's rays on the body in proper intensity, its temperature can be raised to a very high point.

If, on the contrary, a body in space is to be cooled, its sunny side must be made reflecting and its shady side dull black; or it can be screened altogether by means of a mirror, from the action of the sun. In this case it loses its heat into space constantly by radiation. There would be no replacement of this heat conduction from the vicinity (as happens on earth from contact with the surrounding air). In this way by reflecting all heat and receiving none a body could be cooled to almost absolute zero (—273 degrees Centigrade). In practice however this point could not be quite reached, because on the shady side a certain amount of heat is radiated by the fixed stars, and anyway the mirrors could not absolutely shut out the sun.

By using the above described phenomena of radiation it would be possible not only to obtain and preserve in the observatory in space the heat necessary for life but also to produce extremely high and low temperatures and accordingly very violent changes in heat.

CHAPTER IV

The Observatory in Space

THE physical hypotheses and possibilities of space are now known to us. Now for a description of the manner in which our observatory in space must be arranged.

In order to simplify as much as possible the amount of work to be done in space during the construction of it (which can be done only in space suits), the whole structure and its equipment must first be entirely completed on earth and tested as to its dependability. Furthermore it must be so constructed that it can be separated into its component parts very easily, if possible into single completely equipped cells, which then can be taken by space ships into space and there be assembled again without too much difficulty. The materials used must be as light as possible, to lessen the cost of lifting them into space.

The structure ready for use would in general appear as follows: primarily, it must be capable of being made air-tight, against space, so that normal air conditions may be artificially maintained within. To be able to localize the hazard of the escape of air, which would take place in the event of a leak (due for example to a blow from a meteor), proper use is made of division into compartments as in ship-building.

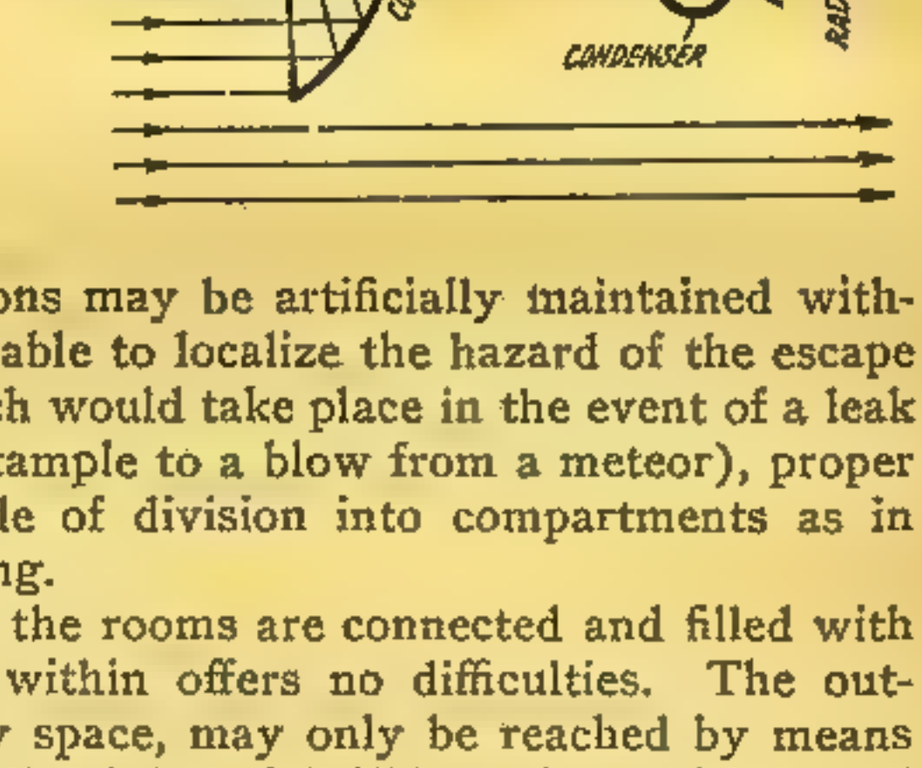

Fig. 18—Scheme of the sun-power plant of the observatory.

Since all the rooms are connected and filled with air, travel within offers no difficulties. The outside, empty space, may only be reached by means of the so-called "air lock." This device, which is well known in submarine use (in caissons, diving bells, etc.), consists essentially of a small chamber between two doors made air-tight. One door leads to the interior of the structure and the other leads to the outside.

If a person for example wishes to leave the observatory (to "lock out"); then, wearing a space suit, he passes through the inner door into the lock, (the outside door of which must at this time be closed). Now the inner door is closed and the air present in the lock is either drawn off or let out, after which the outer door may be opened and the person may float out into the open. To reach the inside of the observatory (to "lock in"), the opposite process is necessary.

The determining factor for the operation, and accordingly for the equipping of the observatory is the fact that there will be absolutely nothing available for heat or power but the rays of the heavenly bodies, principally the sun. But these however will be available at almost any time and in any amount. All materials, especially those necessary for life, such as air and water, must therefore be brought constantly from the earth. Hence the fundamental principles of management in the observatory are clear; rigid economy must be used with all materials, and from the sun's rays must

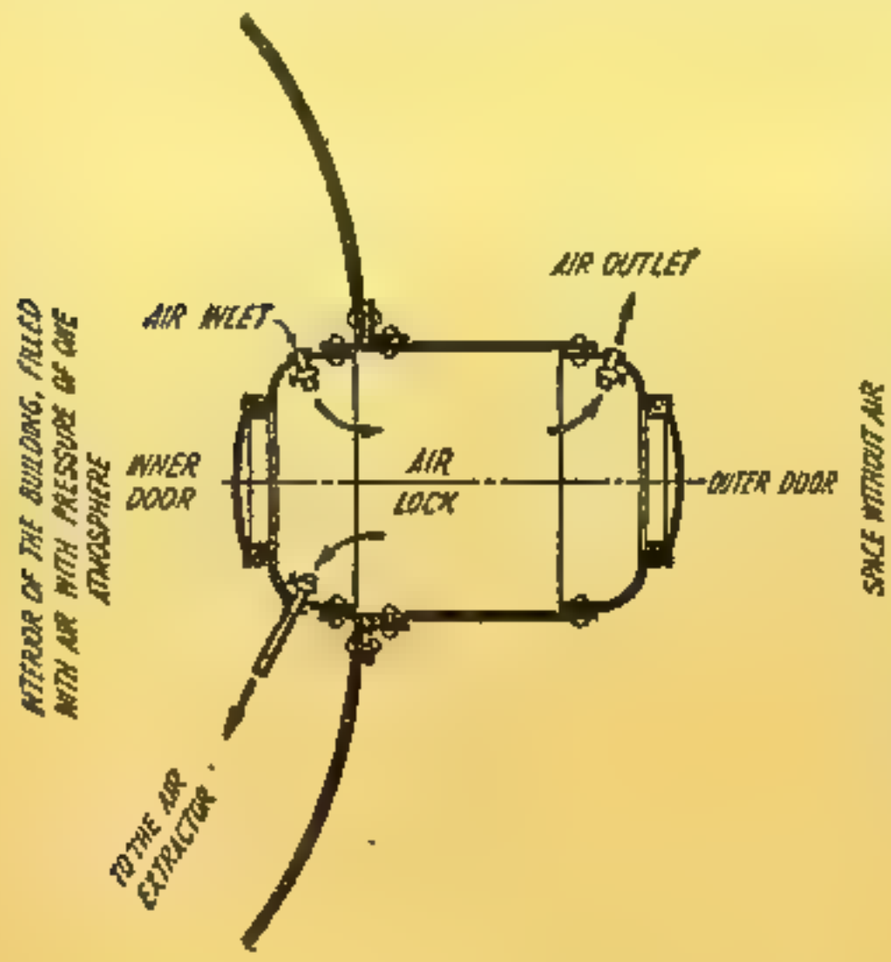

Fig. 17—Fundamental arrangement of an air lock for passage from an air-filled room (e.g. the inside of the observatory) to space. Removing the air when "locking out" is done on economic grounds chiefly by drawing the air into the interior of the building; only the last bit of the air content of the lock is released into space.

be obtained the energy available on the spot in great amounts and utilizing it in most extensive fashion to operate technical devices of all sorts, especially such as make it possible to make the exhausted materials again available for use.

This can be done either directly, by use of the lighting and heating power of the sun, or indirectly, by changing its radiated heat into electrical energy.

The Sun Power Plant

THE sun power plant serving for this last purpose forms one of the most important parts of the equipment of the observatory in space. It provides direct current, is furnished with a storage battery, and resembles in principle a normal steam turbine system of the same kind. There is however this difference, that in the case of our sun plant the steam producer is heated with the sun's rays which are concentrated by concave mirrors to attain sufficiently high temperatures, and the cooling of the condenser takes place merely by radiation of heat into space, for which reason it must be exposed to space and shielded from the sun.

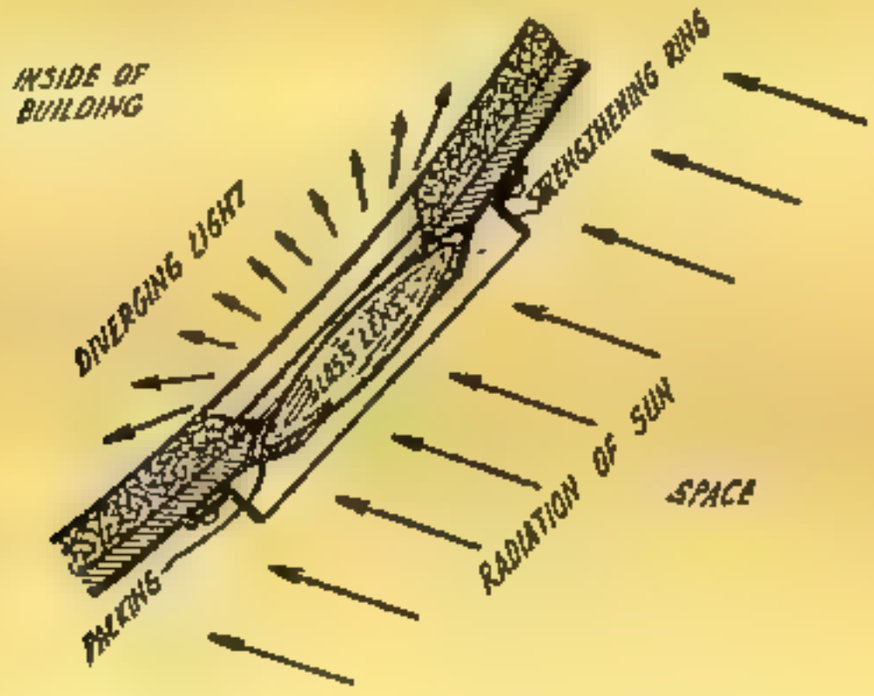

Fig. 19—Diagram of port-hole.

According to what was said before, this requires that both the steam producer and the condenser be colored dull black on the outside. Essentially they both consist only of suitably long metal pipes twisted everywhere, so that even in the weightless condition the inner surfaces are constantly and sufficiently touched by the liquid flowing through.

The liquid is in constant circulation. Unlike the ordinary procedure, the liquid used here is not water (or steam, as the case may be) but a medium easily liquified, namely nitrogen. This renders it possible to keep the temperature of the condensers so low that the extraordinary cooling power of space can be really utilized; also any chance escape of it into the rooms of the observatory would not make the precious air there impure.

Since it depends only on the size of the concave mirrors used how much energy is taken from the radiation of the sun, a suitably efficient construction of the power plant is alone enough to provide the observatory with constant and tremendous amounts of electrical (and therefore mechanical) energy. Since also heat, even in great amounts, may be obtained directly from the sun's rays, and even the lowest temperatures of cold may very simply be reached by radiation into space, all the prerequisites are available for operating technical devices of all sorts.

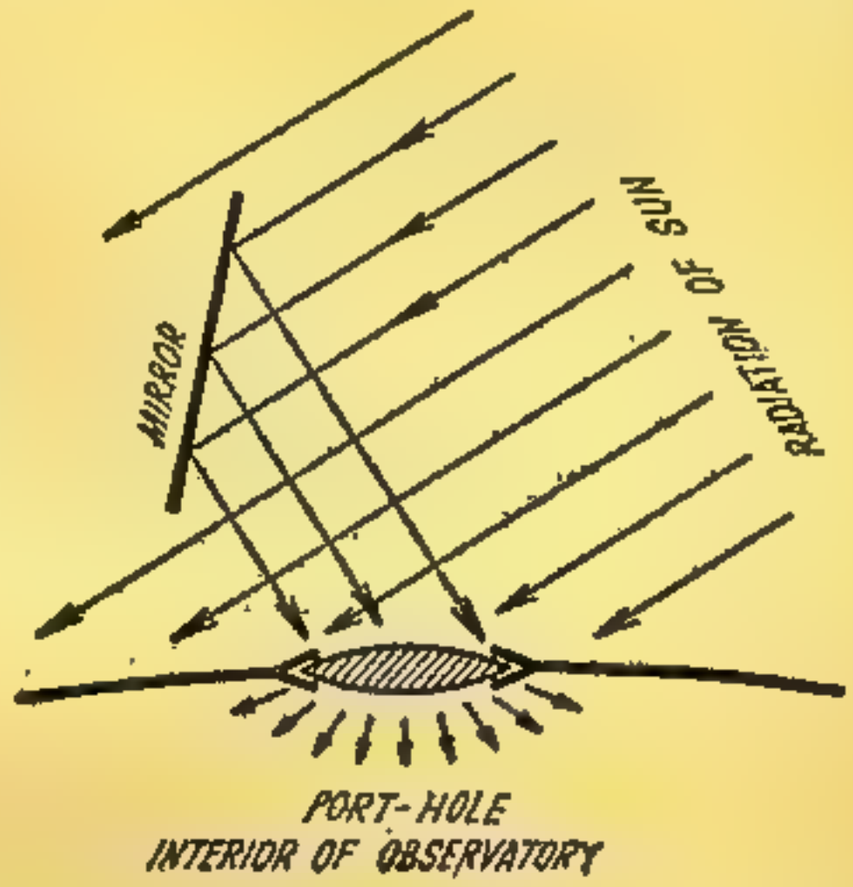

Fig. 20—The mirror expressly directs tht sun's ray's at the port-hole.

The Light Supply

THE illumination of the observatory is most simple to arrange; this requires almost no mechanical devices but can chiefly be accomplished by the direct action of the sun which indeed shines there all of the time, barring occasional brief passages of the observatory through the shadow of the earth.

For this purpose the walls have round openings like the port-holes of a ship, glassed in air-tight by strong-lens-shaped windows. By having these milky white or opaque and by properly selecting the kind of glass care may be taken to free the sunlight of all injurious combinations of rays, just as it

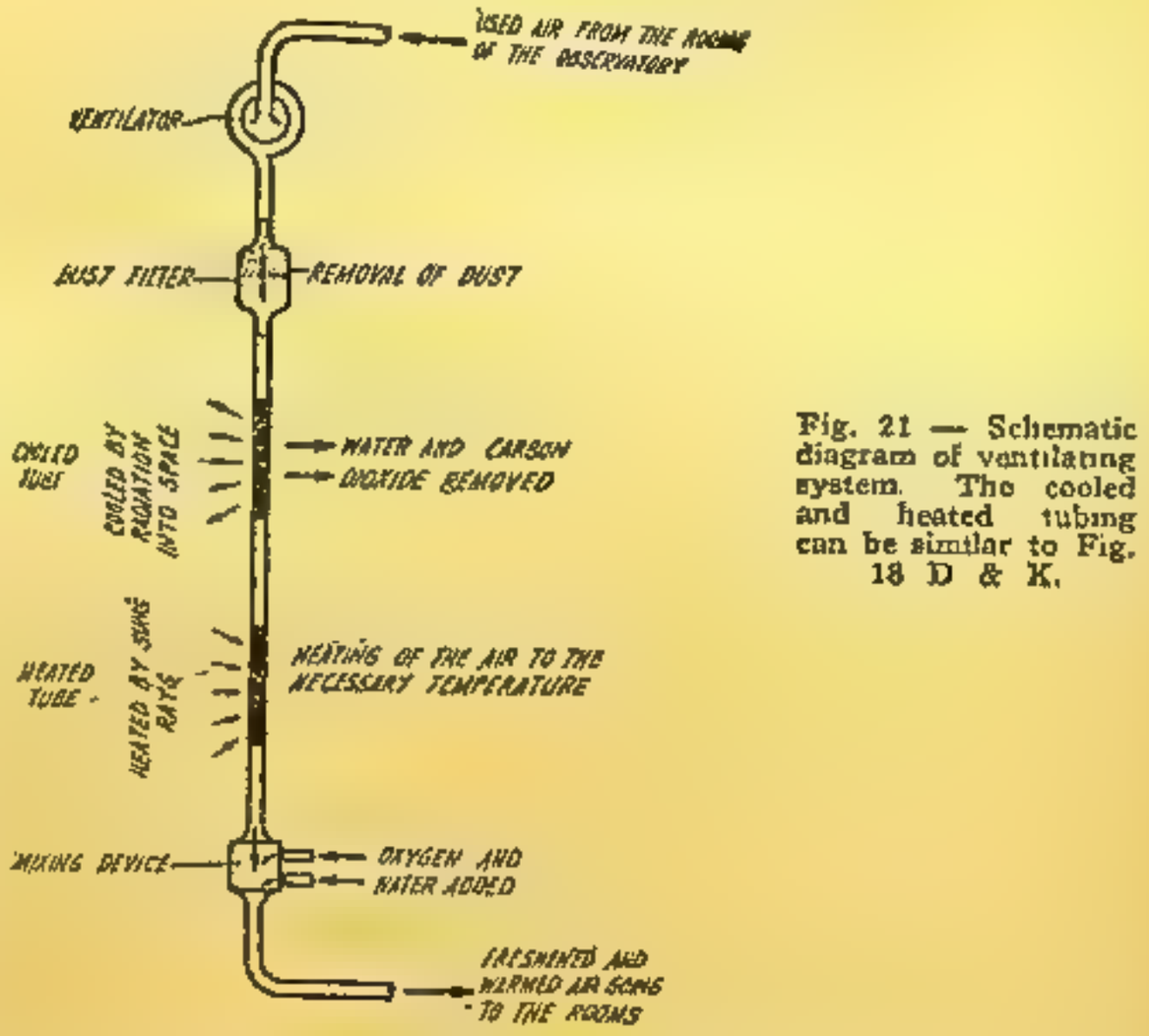

Fig. 21 — Schematic diagram of ventilating system. The cooled and heated tubing can be similar to Fig. 18 D & K.

is filtered by the layer of air. It then enters the observatory in a divergent condition and lights the inside with normal daylight.

Many of the port-holes are provided with special mirrors by which the rays may be directed at will on the ports in question.

There is also arrangement for electric lighting, using the current from the sun power plant.

The Air and Heat Supply

THE heating of the observatory also takes place by direct use of the sun's rays, indeed on the principle of heating the air as it is prepared for use.

For this purpose all the air in the observatory is in constant circulation between the rooms in which it is needed and a purifying apparatus, where it is cleaned, made fresh again, and warmed. A great electric ventilator provides for the maintaining of this motion. There are also pipe-lines which are necessary for this. They enter the different rooms by small screened openings.

The airing system like the apparatus for renewing air is suggested by Oberth. First the air flows through a dust filter. Then it reaches a pipe, cooled by radiation, into space, in which its temperature is gradually reduced below -78 degrees Centigrade, a process during which the gaseous components separate out, first the water vapor and afterward the carbon dioxide. Then the air flows through a heating pipe, heated by the concentrated rays of the sun, to be brought to the proper temperature for the warming of the rooms. Finally the proper proportions of oxygen and moisture are added, after which it flows back again into the rooms of the observatory.

By this process nothing is replaced but the oxygen consumed in breathing, consequently nothing else has to be supplied from the earth. The unused constituents of the air (especially the entire nitrogen content) remain in constant use. Since the outer walls of the observatory have no share in the heating which takes place at the same time, they must be prevented, so far as possible, from giving off heat by radiation into space, for which reason the outside of the entire structure is made absolutely mirror-like.

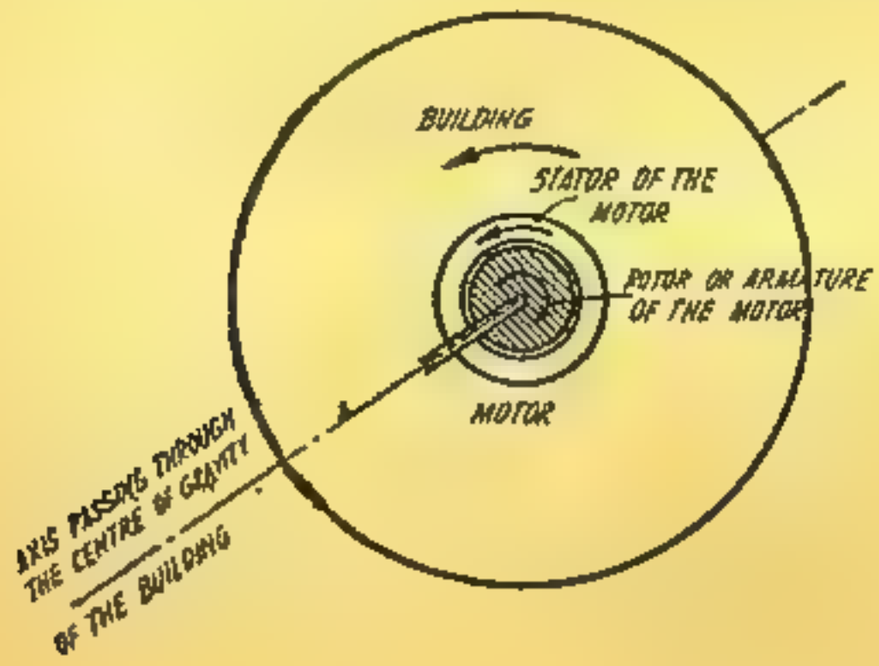

Fig. 22—Operation of a rotary motor.

The water supply, too, must be used as economically as the air. All the water after use is collected and purified for re-use. Great distillation apparatus serves for this purpose, the vaporizing and later condensing of the water being effected in a similar manner as was described in the account of the sun power plant: that is to say, in pipes, some heated by concentrated sunbeams, some cooled by radiation into space.

Distant Communication

THE arrangements for long distance communication are also very important. This may be effected either by phototelegraphy, by means of blinkers, electric lights, search lights, colored slides, etc., or electrically by radio, or even over wires, within the limits of the observatory.

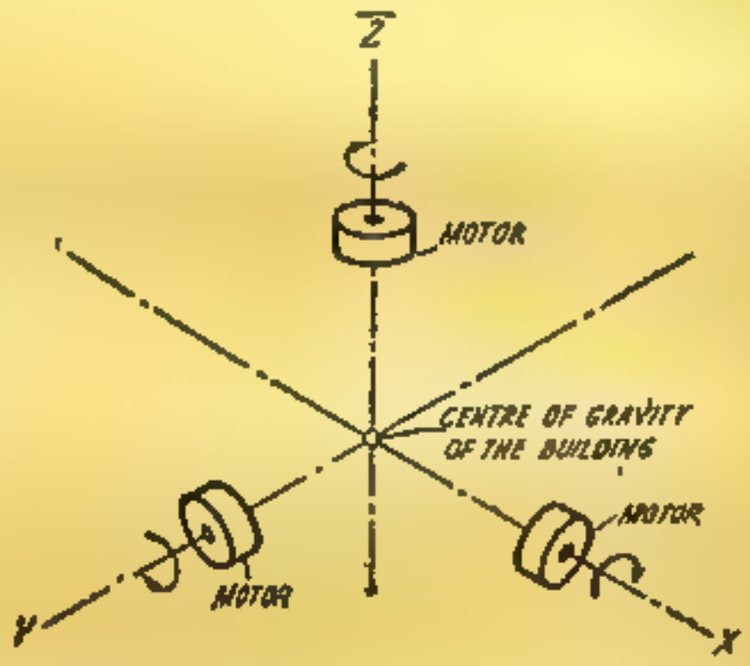

Fig. 23 — Arrangement of the rotary motors. The three axes are perpendicular to each other and pass through the centre of gravity of the building.

In communication with the earth the use of phototelegraphy has the disadvantage of being unreliable, since its use depends on the station on earth being free from clouds.

Therefore the observatory possesses also a powerful radio station, making possible at any time telegraphic or telephonic communication with the earth. The overcoming of the comparatively great distance as well as the screening effect of the layer of air on radio waves is accomplished by using (with the proper choice of direction of radiation) short directed waves and sufficiently high transmission energy. This appears to offer no great difficulty, since electrical energy can be produced by the sun power plant in any desired amounts, and also the construction of any type of antenna offers no serious trouble, in view of the prevailing absence of weight.

The Means of Establishing the Observatory

FINALLY, special rotary motors and recoil devices are provided, which serve both to turn the observatory in any desired direction and to influence its condition of motion as needed.

This possibility must exist in the first place in order that the observatory may be kept in the desired relation to the earth or in the necessary position with respect to the sun's rays. For this purpose not only must all impulses to motion, (coming from outside the system,) which are inevitable in the case of visits by space flyers, be balanced at

all times, but also the influence of the earth's rotation about the sun must constantly be kept in account.

On the other hand this is also necessary in order to allow the observatory to perform its special duties, which will be spoken of later, since for many of these its position in space must be changeable at will. Lastly, at times there may occur the necessity of changing position as regards the surface of the earth.

The rotary motors are normal direct current electric motors, but they have the highest possible number of turns and a relatively large armature. Special brakes make it possible to decrease or check their speed as quickly as may be desired. They are built into the observatory in such a way that their prolonged axis of rotation passes through the centre of gravity of the building.

If such a rotary motor is started, at the same time as the rotor (or armature) the stator (the part of an electric motor ordinarily motionless), can be made to turn and along with this (if they are fixed) the entire building connected with it. The movement will then be around the axis of the motor—of course in the opposite direction to the rotor and much more slowly, because of the difference in mass—this motion will continue until the motor is stopped again. The general rate of motion will vary with the number of turns given. (In the previous case it is a question of a "free system" in which only the inner forces operate.) Since motors can be so arranged with axes at right angles to each other, like the coordinates in a right-angle system of three dimensions, by their cooperation it is possible to swing the building in any desired direction.

(To be concluded)

The Boneless Horror

(Continued from page 141)

interesting levers and mechanisms, the use of which was hard to determine.

Taking a lot of the jewelry with them, they sought civilization to secure help in the exploration of the city. When they returned, a freshet of the Colorado had covered the opening of the tunnel with sand, and they were unable to locate it.

Thus died the great land of Mo.

The fair country of Atlantis had no enemies. It lived only for pleasure and art. From Ireland to the shores of America it lay in the sunshine. Then one day a continent across the globe was destroyed. A terrific shifting of balance of weight took place; large tidal waves rolled from one sea to the other and suddenly the continent of Atlantis was swallowed up by the water of the Atlantic Ocean, and, thus, a kindly lovable people paid the price of the hatred between two nations that they had never harmed. So perished the second of these great lands.

Where Gobi once ruled supreme, now rule the Himalayas. These mountains, the greatest in the world, run nineteen hundred miles from east to west and an average of ninety miles from north to south. They cover a total of one hundred and sixty thousand square miles. Of these mountains, the greatest peak, Mount Everest, reaches upward to the sky twenty-nine thousand one hundred and forty feet above the sea level. Immense sections of these mountains are inaccessible to modern man. Mount Everest remains unconquered.

Hidden in the tops of these mountains, unknown to man save by tradition, lies the ancient capitol of the lost Empire of Gobi. Half frozen Tartars, insect ridden Lamas, barbarians of every description remain as the sole descendants of what was once a great people. Even the memory of their former greatness has been lost in the changing struggles of fourteen thousand years. If they are asked how old these mountains are, they will reply that they have always been there. How could they know that once all this land was lowland, forest land, a pleasant country for rich folk to live in? How could they know of the physician from Mo and his magical table and map thereon?

Yet, amid those mountains, lies the ancient city and the Hall of Dragons. There, on their silken cushions, their beds of goosefeather, lie the boneless Emperor and the boneless Seven Wise Men, and, though their bodies are chilled with the frost of centuries, yet, would there come a pleasant day of springtime, with blossoming almond trees and a warm, gentle shower, those frozen hearts would once again send pulsing life through those boneless sacks, for full of the Jelly food of the Queen-bee they can never die, at least, not for a long, long time.

On the floor in front of the Emperor, lies the body of Heracles, dead of a dagger, thrust by the nervous hand of the woman beloved by the Emperor. The body of the physician, frozen, decays not.

Neither does the body of the beloved woman.

And, frozen in her body, lies the unborn Prince of Gobi, last of a royal line that dared all for their hatred of a bitter enemy.

Thus perished Gobi.

THE END

Science News of the Month

ASTRONOMY—METEOROLOGY

SUN SPOTS CAUSING LAKE FLOODS

Rising waters in the great lakes are causing great damage to the surrounding territory, especially to Chicago where the rise in Lake Michigan is flooding buildings and endangering the foundations of others. That a serious situation exists is evidenced by the determination of the Chicago building inspector to make surveys of many buildings along the lake front and order evacuation should signs of danger be perceived. The average rise in the lakes is said to be 3½ feet. The cause is traced back to the great activity of sun spots this spring, according to Professor Ward of Northwestern University. The sun spots cause an increase in the evaporation of the atmosphere and great precipitation results. This state of affairs is a cyclic one, according to Professor Ward, and we are now having our eleven year period.

METEOR MAY DESTROY NEW YORK

It is only luck, declared Dr. Charles Olivier, director of the University of Pennsylvania Observatory, in an address at the American Museum of Natural History, that the large meteors that have fallen on the earth have landed in uninhabited parts of the earth instead of in large cities. There is nothing but chance to prevent one of these great masses of incandescent iron travelling 20 to 70 miles a second, from striking New York and knocking it "flat as a pancake." In such an event we would witness a catastrophe exceeding that of the Great War. The large meteor that fell in Siberia changed a huge forest into a completely bare area for many miles, the professor said. The entire region is torn and furrowed as tho by a gigantic harrow, and pitted in places with large craters. There are about 20 million meteors visible to the naked eye, and several times that many enter our field of telescopic vision daily. Usually they are burnt to dust by the friction of the air before they come close enough to us to do any damage. But every day a good sized meteor does hit the earth, landing usually in oceans or uninhabited areas.

AFRICAN ROCK IS LARGEST METEOR

We told recently of a rock found in South Africa believed to be a meteor. Now Professor Luyten of Harvard in the *New York Times* states his belief that it is certainly a meteor and probably the largest yet found. It is nine by ten feet on its upper surface, which by the way is perfectly flat, and about five feet deep. It is half buried in the limestone which surrounds it. The composition typical of a meteor is nickel and iron, or nickel-steel, and it has that excessive toughness which is characteristic of that alloy. Professor Luyten believes that it was part of a swarm of solar meteors which came too close to the earth and was captured. This is corroborated somewhat by the finding of a great number of small meteorites in a field nearby. Its life on the earth has been estimated at from a thousand to ten thousand years or more. Curiously enough, while the surrounding country is bathed in the hot sun, the meteor, of all the objects there, is cool to the touch.

EMPTY SPACES NOT EMPTY, SAYS EDDINGTON

The outer spaces of the universe through which the distant stars travel are not merely empty space, as is generally believed, says Professor A. S. Eddington, distinguished English scientist. There is an atmosphere filling the spaces but it is so rare that an amount equal to the smoke emitted by a pipe smoker at one puff would fill 1,000 cubic miles of space. But the entire weight of all this material is equal to half the mass of the stars that move about in it. This statement was offered by Professor Eddington in order to convey how many millions of millions of miles constitute "outer space." The presence of the cloud (if it can be called that) was detected by spectroscopic measurements which found the presence of calcium everywhere in space. However, due to the wave length that our instruments are limited by, we are not able to learn more about this cloud and what it is, says Professor Eddington.

MEASUREMENT OF UNIVERSE COMPLETED

Dr. Ludwig Silberstein before the American Physical Society announced his measurement of the universe as having a radius of 32,500,000,000,000,000,000,000 miles. This is equal to 350 billion times the radius of the earth (thereby indicating the earth's relative importance in the scheme of things). He applied to his calculations the Einstein theories of velocity to the motion of distant stars. A formula was evolved which was applied to thirty-five stars of one type and twenty-four variable stars of another. Dr. Silberstein's calculation gives an answer only 1/20th as large as that calculated in 1924.

FASTEST MOVING OBJECT FOUND

The fastest known moving "object" in the universe has been discovered by Dr. Milton L. Humason of the Mount Wilson Observatory, says *Science*. The "object" is a spiral nebula (a cluster of stars) which is apparently moving away from the earth at the rate of 2,348 miles a second. The determination of the speed was made by noting the spectrum of the nebula as compared with that of stars practically at rest with respect to the earth. If stars are moving away the lines of the spectrum will be displaced toward the red, and if they are coming closer they will be displaced toward the blue end of the spectrum. The explanation is the same as the change in pitch of the sound of a moving body. A train whistle moving toward an observer will emit a sound which grows shriller, while one moving away will have a deeper or lower sound. The light waves of a moving object act the same as the sound waves. The nebula that Dr. Humason found is believed to be about 25 million light years or 6 trillion miles away from us. Therefore the light we see from the star was really emitted 25 million years ago, and in fact, for all we know, the star may have gone out of existence many millions of years ago.

AVIATION

AIR PASSENGERS SPEAK OVER LAND PHONE TO NEW YORK

The first commercial apparatus for maintaining telephonic communication of a plane with the ground was successfully tested when passengers in a plane 2,500 feet above Plainfield, N. J., carried on a telephone conversation with New York. To make the call the passengers called the radio station W3XN of the Bell Telephone Company at Whippany, N. J. As the receiver was cut into the circuit the operator asked the customary "Number please," and thereupon the plane was connected over long distance land lines to New York. The reception at both ends, despite the roar of the plane travelling 95 miles an hour was deemed as good as though one were sitting in a private booth. A four-tube radio set was used on the plane, three being of the screened-grid and the fourth a heating tube to increase the sensitivity. The set is run from a generator attached to the motor, requiring about 2 horsepower.

STEAM-DRIVEN PROPELLER-LESS AIRSHIP PROMISED

A new, revolutionary lighter-than-air airship is promised to New York during the summer by the Bryan Steam Corporation of Peru, Ind. The ship will be fueled with oil and driven by a steam turbine. It will have no propellers but a rotary blower at the nose, which by blowing the air sideways and backward creates a vacuum in front of the ship, which pulls it along. The turbine drives the blower, and the exhaust steam from the turbine, before being condensed, will heat the cabin. With a driving power of 300 horsepower and a cruising speed of nearly 100 miles per hour the craft will have only 1/10th the displacement of the Los Angeles and will yet be able to carry as many passengers. It has no interior bracing and thus is able to reduce its weight 700 pounds and increase its paying load correspondingly. Not the least among the sensational features is the promise that the craft will anchor on top of large buildings in the city.

PLANE TURNS ON AIRPORT LIGHTS

The scream of a wind-driven siren controlled by a pilot 2,000 feet in the air was picked up by an "electric ear" on the hanger of the Newark, New Jersey, Airport and put on three batteries of Westinghouse floodlights providing 24,000,000 candle power. This was the method used to inaugurate the opening of the Newark Airport, and was the first practical operation of this device which, it seems, will be invaluable for aviators trying to locate their position and make a landing. Used in the operation is said to be the most sensitive tube ever developed, the Knowles, grid-glow, which is affected by the energy calculated to be that of a fly climbing up a wall one inch. When the apparatus is set to the frequency of the plane siren it operates only when that particular note is sounded. The tube energy is amplified sufficiently to provide the power necessary to put on the floodlights.

BIOLOGY

SUPERMEN ON THE WAY SAY SCIENTISTS

Through the progress made in the new science of what he calls "developmental mechanics," Dr. Oscar Riddle of the Carnegie Institution's Experimental Station at Cold Spring Harbor, N. Y., believes that the physical and mental characteristics of humans may be improved. Dr. Edwin Conklin, famous Princeton University biologist, agreed with Dr. Riddle that "in the end man will control his destiny on this planet." But, he added, "it will not come in your day or mine." Dr. Riddle bases his beliefs on the altering of human destinies by the successes of "developmental mechanics" in the lower animal world. The salamander, he said, when fed with the anterior lobe of the pituitary gland became twice as large as when it had its normal diet. Similar results have been reported in experiments with rats. He believes that the use of specific hormones, in a pure form, will unquestionably cause the growth of human beings He added, however, that the transmission of the growth will be impossible, but that each generation, by the use of "super medicine" and "super education," would have to produce its own supermen.

VARIOUS DEGREES OF DEATH POSSIBLE

That life, death and injury are quantitative rather than qualitative states is the belief of Dr. W. J. Osterhout of the Rockefeller Institute. The doctor comes to this conclusion after studies made of the single and multi-celled organisms. The method of determining death or life is made by trying to pass an electric current through the organism The resistance of the organism determines its state of life. Dr. Osterhout also finds that a perpetual motion is created by placing a cell in an alkaline solution. The cell containing an acid sap absorbs the alkali, and at the same time creates more acids to neutralize it. This results in a perpetual growth, approaching perpetual motion.

LIFE DEPENDS ON ELECTRICAL ENERGY

Life as a driving force depends on electrical energy, Dr. G. W. Crile told the American Philosophical Society. And when the potential of the body reaches zero then death occurs. Dr. Crile states that tests made on an apple, an amoeba and a rabbit all obeyed the same law in reaching death and disintegration. An electrode inserted in the amoeba showed its potential to be .005 volts. When the potential was reduced to almost zero by leading a current in the opposite direction the amoeba would round up indicating that death was near. When the potential was raised the amoeba became active. "All the molecular and cellular action," Dr. Crile indicated, "depends on electrical force." Electrical potential, he went on to say, is the product of chemical activity and in turn the electrical potential governs chemical activity. The electrical and chemical processes are the governing factors in the characteristics of life. In their absence the organism is dead.

CHEMISTRY

MAN'S DIET AND CHARACTER RELATED

The relationship that exists between our diet, our bodily makeup and our personalities is very marked, according to Donald A. Laird in the New York *Times*. The presence of many diseases, that effect personality and the correction of others, may all be placed upon a chemical basis. The activity of the thyroid gland, for example, which feeds on iodine, as found in salt or fish, determines whether one will be energetic, vivacious and lively, or sluggish and inactive. The personality is effected, too, by diabetes which, it is believed, can be cured by insulin. Then there is the personality that develops from epilepsy, some scientists believe, can be counteracted by a *ketogenic diet*. The effect of the nerves on the personality is not deemed so marked as the effect of the bodily constitution. The old beliefs of the middle ages, then, that a man with phlegm might be phlegmatic in temperament, a man with bile be bilious have certain elements of truth in them.

"Science News of the Month"

portrays in plain yet concise language every important scientific advance during the month. Nowhere can the average reader get such a wealth of accurate and vital information condensed into such a small volume. Some 42 scientific journals as well as a score of other sources are utilized by our editors in the compilation of this department. The publishers welcome short contributions to these pages from the various scientific institutions, laboratories, etc.

"KICKLESS" ALCOHOL DISCOVERED

An alcohol produced from petroleum wastes which is without the usual "kick" has been devised, says Professor Norris, director of the chemical research laboratories of the Massachusetts Institute of Technology The aim of the experiments that discovered the alcohol was the utilizing of oil wastes to make useful things. The alcohol is named *isopropyl*, and studies are being made on it to extend its possible range of industrial uses, possibly the substitution of it for ethyl or grain alcohol. Altho it is like other alcohols in substance, said Dr. Norris, its psychological effect on humans is much different. It produces neither exhilarating or deadening sensations. The program that brought about the discovery of this alcohol is part of a large plan to utilize all possible by products of petroleum emulating the great work that has been done with the making of useful materials from the by-products of coal distillation. Incidentally, Dr. Norris said that research men to fill the posts open are notably scarce.

EVOLUTION—ARCHAEOLOGY

MAN AND MONKEY ARE COUSINS SAYS ZOOLOGIST

Another theory on the famous man-monkey relationship comes from Professor Robert Heger of Johns Hopkins University, as recorded in *Science*. Professor Heger believes that man was descended from the monkeys, and cites as his evidence the fact that man and monkeys have for the most part the same body parasites. The principle well-established is that each species of animals is attacked by its own special parasite. Therefore concludes the professor, "the protozoan parasites of monkeys and men have descended from protozoa that lived in the ancestors of monkeys and men, so they must both have had the same ancestors."

NO MISSING LINK OF MAN TO APE

That the hunt of scientists for the "missing link" between man and his supposedly ape cousin is doomed to failure, is the opinion of Dr. Austin H. Clark of the Smithsonian Institute. For the hunt for the missing link is founded on a theory of evolution which Dr. Clark believes is fallacious. Evidence so far presented by skeletons of early man, does not prove the theory of a straight line of evolution of which the ape was one stage and man a later. Nor does it prove a theory of an evolutionary tree, of which man is an offshoot from an ape branch. What Dr. Clark believes really happened was that cells starting from the single-cell began to split and multiply in different ways, and from the method of dividing came the general forms of life. That part of life in which man can be included comes from four general types of animals. Between each two of the four primary types (arranged in a circle) is another type composed of the characteristics of each two. And between each of the four secondary types are four other types composed of combinations of their characteristics. Man therefore is one of these types so formed of combined characteristics. The ape is another type. That a line of evolution, straight or tree-like connects them, Dr. Clark doubts.

MAN'S GROWTH ON THE UPWARD PATH

Man has not yet reached the apex of his development, either physically or mentally declared Dr. Ales Hrdlicka of the National Museum of Washington, before the American Philosophical Society. Man will have in the future a moderately larger brain size, with more brains; a moderate growth in stature, he will become more and more bald and more and more handsome; his appendix will be smaller, and his bodily temperature higher. Dr. Hrdlicka believes that man's childhood lasted about 300,000 years, and that his manhood dates from the glacial period. "Man, however," he said, "is still as plastic in mind and body as he ever was, probably even more so; he is still struggling with environment and controlling it more and more every day." Speaking of eugenics he declared that if man were given the opportunity to order his own selection in fifty years we could have a product superior to anything that exists today.

SEEK ORIGIN OF MAN IN AFRICA

Professor Ivan Broman of Lund University, Sweden, will visit Africa shortly to study the embryos of apes found there. With this he hopes to be able to prove that man did not descend from the monkey. He and his associates will also collect the remains of vertebrates around Lake Victoria Nyanza in East Africa and add them to the collection which his Lund University already possesses. Another group of Swedish scientists will make excavations in the Holy Land for remains of a civilization antedating the Israelites. They hope, through this, to accumulate evidence to determine where the cradle of civilization really was.

MAN PROBABLY 1,000,000 YEARS OLD

As a result of a symposium the age of man at a recent conference of the American Philosophical Society was placed at certainly several hundred thousand years and perhaps a million years. An exact determination, it was agreed, was impossible until geologic investigations upon which so much depends have been done much more completely. Dr. Breasted, one of the members who has been doing much research along archaeological lines, said that the deductions of geologists and others place the seat of early civilization in Egypt, where a degree of culture flourished, surpassing that of any other in Europe or Asia. "The mature and highly refined civilization that emerged in the Nile Valley after 3000 B.C.," he said, "must have required a long social experience exceeding in age the parallel development of cruder contemporary culture of Babylonia and others."

GEOLOGY

TEMPERATURE OF EARTH'S INTERIOR UNKNOWN

We still have no definite means of knowing the temperature of the center or even the interior of the earth, says Professor H. H. Sheldon in the New York *Herald-Tribune*. Many wild guesses have been made some giving it as high a temperature as 443,000 degrees Fahrenheit and others maintaining that the interior of the earth is cold except for what radio-activity exists. The theory of the former is that the rate of increase of temperature that exists for the first two or three miles below the surface continues for the whole 4,000 miles. This seems, to Professor Sheldon, to be manifestly absurd. The theory of the latter is that the earth is a solid body and its heat comes only from internal changes in its elements. Professor Sheldon doubts that the earth's interior has a higher temperature than 11,000 degrees Fahrenheit. He believes that at thirty miles down we should meet molten lava, which is however under an extremely high pressure. It is the upward thrust of this lava thru rock fissures that cause volcanic action.

MOLTEN GLASS FORMS EARTH'S CORE

The interior of the earth is composed of molten glass at a temperature of 50,000 degrees centigrade and under a pressure of 50,000,000 pounds per square inch, declares Professor Reginald A. Daly, of Harvard University. This vast inner ball has a radius of one half of that of the earth. Outside of this core are various shells of which the surface of the earth is one. We live merely on the crust of the earth the crust being thirty miles thick. And from the movements and sliding of the crust on the inner layers come continual earthquakes. He explains the formation of the earth from gases pulled away from the sun. During the stage in which the earth was passing from gaseous to molten state some catastrophe happened to the earth and a chunk of it was pulled away to form the moon. The earth is still trying to correct its lack of symmetry and the movements that cause the earthquakes are part of this process. The crust we live on is composed principally of granite, beneath which is a form of basalt.

EARTH SAFE FROM GREAT EARTHQUAKES

The earth is reasonably safe from disastrous earthquakes for a while, is the conclusion given to the members of the Seismological Society at a recent convention. This is certain knowledge for the great number of seismological stations have instruments so sensitive now that they can record the slightest tremors thru the earth. By these stations, geologists hope to go ahead to study the mysteries that lie in the earth's interior, declared H. H. Cook of the U. S. Geodetic Survey. "We are beginning to build up a new medium of knowledge and learn how to understand the structure and nature of the globe by analyzing the waves that are set in motion thru the body of the earth by tremors and shocks to the earth's crust." About one perceptible tremor will be felt every twelve months in the eastern part of the United States, but geological conditions are reasonably safe from any earthquakes. The rift in the earth that caused the San Francisco 'quake of 1906 has been studied and has been mapped for a length of 190 miles.

MEDICINE

SCIENTIST LEAVES BODY TO SCIENCE

In order to continue his contributions to science even after his death, Dr. Daniel S. Lamb, distinguished pathologist, had provided that his body should be dissected after his death. He died recently, and at the Soldiers Home Hospital where the death occurred, the dissection took place. The instructions as to how it was to be performed were all written out by Dr. Lamb before his death, even to the prescription of a formula to use in preserving his brain. The brain was sent by his direction to the Wilder brain collection at Cornell University, the skeleton will go to the Army Medical Museum or the Howard University Medical School and the heart and other vital organs might be disposed of by his family. Dr. Lamb in order to aid in the conclusions to be derived by the dissection wrote a complete medical history of his life, incorporating all his diseases and the probable influences on his body.

SUGAR WATER CURES ULCERS

A simple cure for the terrible ulcers of the stomach is the administering of three ounces of sugar water, before meals four times a day.

TOOTHLESS RACE IN THE OFFING?

That the tendency toward an early decay of our teeth is becoming more and more serious is the conclusion of Professor Charles F. [illegible] of [illegible] University. He urges dental research to determine especially the cause of decay and the loosening of teeth and then in order to save mankind from a toothless future. So far as we know decay comes from two sources. One acid is formed by fungi or the residue of food in the mouth, such as white bread and cereals and from the work of bacteria. Pyorrhea attacking one at the age of about fifty and causing a separation of the tooth from the gum is a disease about whose cause little is known. We must cease to regard dentistry as merely a reparative profession but must begin to search for causes and prevent them if the human race is to be saved.

PARAFFIN INJECTION FOR TUBERCULOSIS

One more treatment for tuberculosis comes to swell the thousands that have been propounded. The effect of this latest, the injection of paraffin into the lungs, has been reported by Prof. Hugo Hauke of the *Herrnprotsch Hospital* of Berlin. Prof. Hauke's method which he claims is sixteen years old but little used, is to use paraffin to fill the little cavities in the lungs that form during pulmonary tuberculosis. The treatment in Prof. Hauke's word is that "the diseased parts of the lungs are carefully separated from the parietes [illegible] of the cavities of the chest, thus causing the cavities to collapse. Then into the resulting space between the lungs and the parietes is put the paraffin plug. It is put in in a plastic condition and inserted so that the cavities remain flattened out so that the healing process can begin. This method needs great skill on the part of the surgeon, but if properly done takes the place of removal of ribs and surgical incisions. It is said to meet with great success in Germany.

PHYSICS

A "DEATH NOTE" CREATED

A sound which striking the ears of one nearby kills him is the invention claimed by M. Marconey of France. This device he wished to present to the League of Nations to punish offending nations. His sound, he believes, would be meant death to an entire army. He also believes that a nation could protect itself by an entire bulwark of sound so that no aviator could penetrate it. He foresees an entire army or nation destroyed by pressing a button thousands of miles away.

ELECTRIC LIGHT AND RADIO IN ANTARCTIC

The use of electric power and the radio are among the means used by Commander Byrd to make his Antarctic expedition a success. The radio alone speaks for a scientific achievement in the expedition's present and future communication with the homeland over 10,000 miles away. The use of electricity speaks for Byrd's utilization of whatever nature has to offer. He has with him a two kilowatt electric generator driven by a gasoline engine. This supplies most of the expedition's need for power. A windmill however is used to make power from the severe winds that characterize [illegible] The [illegible] is exhausted a range of [illegible] The [illegible] of the [illegible] also characterizes [illegible] ingenuity. In order to supply power for the plane's radio equipment a generator is directly [illegible] to the [illegible]

and the plane has to and three auxiliaries make communication with the base a certainty. First there is an auxiliary gas engine. If that fails there is a hand-driven electric generator. And as a final refuge there are storage batteries. To maintain the health of the crew during sunless days of the Antarctic winter there are sunlight lamps, and each man will be "sunned" by them fifteen minutes each day.

TELELUX, BROTHER OF TELEVOX, APPEARS

A new mechanical servant, or robot, the [illegible] operated by light has been demonstrated by S. M. Kitner of the Westinghouse Electric [illegible] The robot is similar in general principle to the former. In case of the newer man he is operated by a light pistol which [illegible] A beam falls on a photo-electric cell in him which selects three circuits to be operated. A second shot from the pistol operates one of the circuits, [illegible] to put the lights on in a room or extinguishes them. The number of flashes of light on the [illegible] turned out. A single flash on the operator cell [illegible] to be possible to operate him from a distance [illegible]

[illegible] remember the robot [illegible] by Dr Kenner of the [illegible] Power [illegible] [illegible]

ARCTIC COLD WILL PRODUCE POWER

A plan to produce power and heat by utilizing the difference in temperature between the arctic ice and the unfrozen water underneath is presented by Dr H Barjou of the French Academy of Science. This startling plan, Dr Barjou believes, will provide power to make habitable these arctic wastes and in fact the colder the temperature becomes the greater the power that can be produced. Normally, he states, the temperature of the water under the [illegible] degrees Fahrenheit while the temperature of the air may be [illegible] less. Thus a temperature difference of 80 degrees or more is established. The unfrozen water would be pumped into a tank where in turning to ice it would liberate heat. Freezing a cubic meter of ice liberates as much heat as [illegible] the heat produced would vaporize a volatile hydrocarbon which would drive a turbine. For condensing the hydrocarbon again, Dr Barjou would use stored blocks of brine or cryh as he calls it. He states that the amount of energy thrown into the Arctic [illegible] would be [illegible] Antarctic [illegible] Canada where coal is too expensive and water-[illegible]

RADIO-TELEVISION

TELEVISION EYE FOR ARMY PLANES

[illegible] Iran is [illegible] television inventor, now plans the use of a television set in airplanes to record faithfully the activities of enemy troops for army commanders. He plans the installation of a receiving set in a plane which above an enemy position would record what is going on, and transmit these images to headquarters [illegible] as far as [illegible] away. This would indeed make fighting from a distance an actuality. Construction of the set is progressing and first tests are expected to be made shortly.

EDUCATION BY RADIO FOR SCHOOLS

Education by radio for the public and high schools is advocated by Major-General George O. Squier, retired, before the National Academy of Sciences. The effect of this would be not only to provide the best teachers for the students but will also reduce greatly the annual bill of $2,000,000,000 which is spent in the American schools. Gen. Squiers has an invention which he calls the "monophone" which he calls a "one way telephone for program service" which he believes can be installed into every home, in order to fully utilize the telephone, for multiple program service. How this is to be done, was not explained. Referring, however, to his educational program, he asks for the use of radio and television in the schools so that the best minds of the country might serve every youth the nation can educate. "The needs for new channels of communication require that ultimately both the telephone wires and power wires into the home should be utilized in competition and cooperation. The great university of the United States both for youth and adults can become in the era ahead, the greatest educational and cultural institution in all history. Radio is the new agency by which alone this is possible."

TELEVISION FOR EVERYBODY

That everybody who now has a radio set will have television in his home within ten years, was the belief of Joseph D. R. Freed of Charles Freshman Company. Many, he says, will have them in five years, but he doubts whether much can really be done in a shorter time. It will not be necessary to scrap the radio sets that are in use in order to receive pictures. For the development that is going on will permit of the use of television with ordinary present day receivers. The Freshman Company is now asking the Federal Radio Commission for two television waves in order to make a service of use to home experimenters.

LOCATION FINDING FOR SHIPS

A rotating radio beacon to enable ships to locate their position is described in a report made by the Department of Scientific and Industrial Research of Great Britain. The apparatus consisted of a transmitter having a rotating loop or coil and a receiver of the common wireless variety. The report described tests made on ships during actual sea conditions to determine the relative accuracy between this method of location and the ordinary range finder. It finds the beacon system to be just as accurate, and to be peculiarly fitted for small ships.

RADIO NEWSPAPER NOW

What has been predicted by science fiction writers, the receiving of our news by merely tuning in by radio, is about to become an actuality if the Federal Radio Commission grants the request of the National Radio Press Association to establish a chain of radio newspaper stations in principal stations. Broadcasting stations have already been sending out news items, especially when some important and unexpected event occurs, but a regular service has not yet been established.

SCRAMBLED WORDS ON RADIO-TELEPHONE

The lack of privacy of the inter-oceanic radiotelephone service now operating between the United States and European countries has so far acted as a bar to the extension of the service. That it is a real bar may be judged from the belief that much of its future use may be in conversations between diplomats of the same country. But already scientists are at work at the problem of making the speech "scrambled" or unintelligible to an eavesdropper while it is perfectly clear to those who are speaking.

(Again we refer our readers to what science fiction writers have written about this. Science fiction, it seems is hardly "nonsensical rubbish."—*Editor.*)

TELEVISION JUST AROUND CORNER

"Television is just around the corner," as far as public reception is concerned says Dr. Alfred N. Goldsmith, vice president of the Radio Corporation of America. Dr. Goldsmith made this statement at a demonstration of the powers of television at his home recently. It is now entirely possible to take the television eye to a properly staged boxing match and project the contest in a satisfactory manner, by a method which does away with the old scanning disk. What the method was Dr. Goldsmith would not divulge. He believes, however, that all the owner of the set need do in the future is to plug in on his light socket to receive pictures of any broadcasted event. As an added attraction of the demonstration Dr. Goldsmith tuned in on a musical concert and caught visually the patterns made by the sounds. He received a series of weird and striking patterns of faint shades of pink and brown with diagonals, herringbones and zig zag herringbones. As the pitch and shading of the music changed the patterns changed also.

GENERAL

2,000 TONS DUST IN NEW YORK AIR

The atmosphere above New York consisting of one trillion cubic feet was shown to have contained 2,100 tons of dirt on a clear day by Professor H. H. Sheldon of New York University. Professor Sheldon's figures are gathered partly from studies of the air purifying apparatus of two large New York theatres. He believes that if his figures are true then the air New Yorkers breathe is quite possibly a source of pulmonary diseases during windy days.

NO MYSTERY IN HYPNOTISM

There is no great mystery or super-natural display of power in hypnotism, says G. H. Estabrooks, in the *North American Review*. The art of the hypnotist is open to everybody because it is merely taking advantage of a natural condition. The state of hypnotism, it is explained, is not much different from that of of somnambulism. In both cases the sub-conscious mind of the subject becomes dominant and responds to influences and suggestions from without.

EGYPTIAN DESERT TO BLOOM

In our previous issue we mentioned the plans for the transforming by creating artificial lakes, of part of the Sahara into a veritable garden. Now comes a similar or further plan sponsored by Dr. John Ball to make habitable a desolate part of the Libyan desert and to get at the same time about [illegible] horsepower of hydro-electric energy. He plans to make use of a great depression in the desert known as the Qattara Depression. This is between [illegible] and 440 feet below sea level. Water will be piped in by tunnels from the Mediterranean 40 miles away. It is believed that the power thus provided will not only allow enough for irrigation but will supply the present needs of all of lower Egypt. Ambitious promoters are already seeing this prospective garden as a pleasure resort for rich Cairo business men (Cairo is [illegible] miles away). The Lake formed by the depression will be about 7,000 square miles in area.

UNDERSEA MYSTERIES REVEALED

The life that exists in the lower depths of the seas where the pressure approximates 15,000 pounds per square inch is still among the unsolved mysteries of man. William Beebe the explorer has recently done some fishing on the Hudson gorge, the water extending 100 miles eastward of New York and brought up many interesting specimens. Among his deep sea finds are many fish that produce their own light to find their way about in the unlighted depths. Many have rows of lights along their side and others have a particular member of the body that is luminiferous. One fish had in a transparent sac a bacteria that produced this cold light. And to illustrate what has happened in the evolutionary scale, Mr. Beebe found also a female that had attached to its side a little specie that turned out to be the female of the male.

SCIENTISTS NO PHYSICAL WEAKLINGS

The time-honored conception of a scientist—some weak runt of a man barely able to drag himself around, must be dispelled according to the result of researches announced by Dr. Hrdlicka before the National Academy of Sciences. Dr. Hrdlicka announces the result of measurements made during five years on the members of the National Academy themselves who are supposed to constitute the cream of American Science. "The essential results of the study," says Dr. Hrdlicka, "are the conclusive proofs that in science, at least the strongest and ablest healthy minds go generally with strong healthy bodies that attain and [illegible] a larger than average head and brain; and finally that such intensive mental work does evidently not tend toward a shortening of the life of [illegible] workers." Dr. Hrdlicka had found that the examination of the 250 scientists of the National Academy showed them to be superior physically to the average American even to the [illegible] American.

HOMES OF FUTURE WINDOWLESS

The home of the future will be windowless, says Albert Parsons Sachs in the New York *World*. The window, he contends, no longer serves a useful purpose and, in fact, it has many objectionable features. It does not give us the real benefit of the sun because glass withholds the precious ultra-violet rays. It allows too much heat to escape in winter and lets too much in in summer. As a means of ventilation it is too drafty and admits dust and dirt along with fresh air. Therefore, in the future home, there will be only an occasional window there will be ultra violet lamps to give us what we want from the sun, and ventilating systems will distribute streams of clean fresh air, warm in winter and cool in summer.

SUBMARINE LIFE-SAVING DEVICE TESTED

Attempts to build life-saving devices for sunken submarines are being pushed extensively, especially in Italy where a new device was successfully tested. This consisted of a tube which the members of the crew entered and which sent them to the surface of the water. The experiment was made on a Brazilian submarine. A diver was able to enter the submarine which lay at the bottom of the harbor, converse with the crew, and return again to the surface of the water. The metal tube runs thru the submarine's hatch over the torpedo room, the end of the metal tube ending within the submarine in a topless steel box. An air pressure of three atmospheres (about forty-five pounds per square inch) is introduced into the latter room when it is submerged to prevent the water from rushing in. The water comes thru the tube but is checked when the steel box is half filled. The person wishing to leave the submarine is first equipped with diving apparatus and moves to the steel box finds his way to the tube and in it shoots to the water's surface. Further tests will be made.

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What Science Fiction Means To Me

WHEN the publication of SCIENCE WONDER STORIES was first contemplated, the editor of this publication addressed a number of letters to science fiction lovers. The editor promised to pay $50.00 for the best letter each month on the subject of "What Science Fiction Means To Me." This contest will run for three months, of which this is the second number of SCIENCE WONDER STORIES. The last prize winning letters, therefore, will appear in the August number.

The response to the request was so great, and such a large number of most excellent letters were received, that it is only possible to print a few of the best ones. We are sorry we are not able to publish more of them. The editor congratulates Tom Olog on his fine conception, and we hope our readers will agree on the selection.

The remarkable letters printed here show in what esteem science fiction is held by our readers and authors.

First Prize $50.00

The Gift of the Master Mentality

(Written somewhat after the style of E. A. Poe)

A monstrous black bulk, covered with shining scales, sank into the crimson flood which seethed over the entire vision. Blackish vapor floated in quavering lines from the outlines of the leviathan, to reach up and twine around the flaming sun of green which floated calmly off in space and to some extent illuminating the inmost depths.

Suddenly a purple haze covered a small spot in the center of the monster. Great white sparks of lightning shot away in sweeps which cleared the limits of obscurity on great leaps and bounds, lighting up the ghoulish sea amid loud cracklings.

But the noise abruptly ceased.

"Oh, Master of the Universe!" suddenly came a roaring thought from the now silent flowing sparks. "Oh, Master Mentality, Center of Ultra Universe."

And then shot back from the depths a thunderous "WELL!"

"Master. I am Thaght, Scientific Supervisor of the farther Top Side of Ultra Universe. I have made an extraordinary discovery, and am in a great quandary. I cannot trust even the great thought rays. I must get direct transmission. So I take the liberty of addressing even you."

"PROCEED" rumbled the answer.

"Oh, Master, this is my tale.

"Now I am, as you know, a great traveler in my farthest Top portion of the assigned Universe. My curiosity has led me to many remarkable discoveries, as you well know, but none so unique, so utterly fantastic—

"I was traversing near the outer edge of my realm and had taken snapshots from various combinations of mirror universes. As I came back towards our government seat I took a longer trip than usual and went in a great circle out into the undeveloped GREAT STATE. At a stray fancy, I turned on my Reducto machine and proceeded to become one two-millionth of my normal size. Never before had I been so small, when suddenly I rushed by a tiny star universe, where there was supposed to be nothing but space. So, halting my pace, I proceeded to search for intelligent beings. I found many and have now established authority over some few millions of planets. All of which would seem an everyday occurrence but—

"There was one little planet called Earth which swings with several others around a tiny sun on which were people of a mentality so low that I have failed to establish communication."

"INCREDIBLE!" gasped the Master.

"Yes, it would seem. But absolutely true. Never before had I such a case. Therefore I sought to understand some of their mental reactions with reference to what is the betterment of their race. So, using my Ultravisor, I watched at random for the great happenings of the planet. I may surprise the present race goes back but a few million years.

"UNIVERSAL HEAVENS!" snorted the Master.

"The first man I visualized was a fellow called Christopher Columbus. He was a going amongst a group of courtiers that the earth was round. They laughed, tapped their heads and called him a liar."

"OSMOTIC SYNCOPATION!" yelled the emotional Master.

"I turned up Time a few years and I next saw a great scientist who declared that their speech, which was transmitted by vibrations through matter, could be sent around the world. He was [illegible]

"DIVINER!" was the exclamation the Master's brain immediately leaped upon.

"It was the same with light pictures. The scene I last saw was around a few men who talked of traversing Space and Time. People were actually injuring themselves laughing."

"HMMMM!" The irrepressible Master's thoughts were a concentrated growl.

"Now I have hurried to you! What shall I do? These people all have a strange quirk in their brain which holds back faith in the future and discards new thoughts. This alone has kept them hampered since the time Life began. Countless millions of times life has been exterminated on this planet, only because their advance of knowledge, the coordination which is possible only through complete faith in Science, was lacking absolutely. So the race has been overthrown—only to build up life again. But they have never reached a stage where they are masters of the catastrophes which have come in various forms such as ice ages, floods, rarefied air, etc. The question is, what shall I do?

"WELL!" the answer came grim and slow. "It is really very easy. I am sending you by a thought-ray a new instrument. With it you can imprint on the minds of these people the value of foresight as to the aid of scientific progress. This will prepare their minds for great advancement. I have no doubt but that with this they will soon surpass or at least equal our great planet minds since it will accelerate their speed of advancement to a highest possible stage. This thing of which I speak will become known on earth where it will be brought to the brains of people by their favorite recreation which is fiction reading. This thing is, an ultimate weapon, SCIENCE FICTION!"

• • • • • •

The great black hulk disappeared and the sun of green over the sea of blood vanished in a mist.

Tom Olog.
San Bernardino, Cal.

First Honorable Mention

An Escape from the Monotony of Life

Science fiction to me, either in the reading or the writing of it, is a sort of medium for escape from the monotony of an everyday life which in spite of modern miracles sometimes becomes rather stereotyped and boresome.

In particular, the greater part of present day fiction seems to follow a path as well defined as a modern highway, and a general sameness of subject matter leaves the reader with the feeling that having read one he has read them all.

Aside from the reading of texts as a pure study personally I read fiction for amusement and diversion, and when I am so unlucky as to get in the midst of one of those so-to-speak cast in a form types of stories then the amusement derived is certainly small and the diversion is nil. As for imagination, or the exercise of it, it simply stays dormant.

It is then that science fiction comes into its own. Reading it stirs the imagination and keeps one in a pleasant tingle of anticipation, eager to grasp the workings of the fictional wonders which one day may indeed become facts. Writing it forces one to stir his imagination to its depth, and more, it demands that the writer spend many long hours poring over texts of the known sciences, for editors and readers alike insist that the groundwork must be [illegible] the science details imaginative though they may be must be based on truth.

In either case one is amply repaid for the time and effort spent in reading or writing, even though the written tale never appears in print. One has developed his imagination and given himself new mental riches.

Imagination! It is the key to happiness! Show me a man who feeds his spirit through imagination and anticipation and I will show you a happy man whose every minute is filled with pleasant activity. Show me one who neglects to develop himself in such manner and he is one you can point out as restless, discontented, with many empty hours dragging wearily down on him.

With so much to offer, and in such a pleasant manner, does not science fiction more than justify its claim for a place in the literary world, and contribute its full share to man's entertainment and happiness? My own reply is a most sincere and honest "Yes!"

James P. Marshall,
Providence, R. I.

Second Honorable Mention

Directing the Way to Truth

I am only a boy of twenty years with a limited public school education. Have been necessarily attracted to science all my life but because of the restricted circumstances of my family have not been able to study it as I would like to.

I will honestly and sincerely attempt to explain what science fiction means to me.

Science fiction is a conscious admittance of the propensity of our perceptions and is the effort of man to interpret the Supreme Order of Things. It is the struggle to reach beyond superstition, habit and standardization, to attain the goal that means unbiased truth and proper appreciation of God.

God is Truth, and science is the fundamental essence of truth.

Science fiction discards our attitude of seeing only the tips of our noses and makes a frank effort to remove the veil of prejudices promoted by limited monitors of comprehension. Religion sets forth the allegorical truth while science gives us the practical truth.

Life is a habit. Rather all manifestation of physical life is a habit. It is a mechanical habit promoted by impressions admitted to the brain by means of senses. In the case of the human being there are normally five of these senses with a three dimensional restriction.

All of our thinking, our living is done by means of objectives admitted to the mind compared with other environmental objectives. The result is an adaptation or accommodation standardization. Therefore life is taken for granted and results in a standardization of thinking which recognizes nothing beyond the momentary mechanical five sense objectives of three dimensional limitations.

Beyond this, superstition and custom explain most things not understood.

Standardization explained in another fashion is the environmental suggestion filtered through our limited capacities of cognizance and retained as a measuring stick to gauge all other sensations.

Naturally, the true relation of our status in this great scheme of things is not apparent.

Science fiction acknowledges this.

Slowly, but positively, it is feeling out and directing the way beyond mechanical habit and standardization to the truth.

Mabel Hunt,
Muscatine, Ia.

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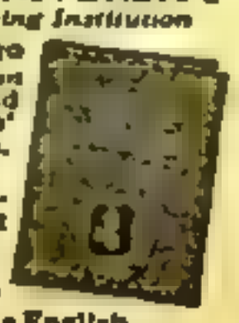

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Fires the Imagination

To me science fiction means a wholesome and instructive recreation. It is so far above the commonplace and yet within the bounds of human science and effort; that it holds one's interest, fires the imagination, and spurs the ambition to learn and labor more in the fields of science. It means a wider mental horizon, because it opens vistas of immeasurable realms of possibilities, whether it be of interplanetary travel, higher dimensional activities, non human intelligence, or unusual combinations and applications of mundane sciences.

I have noticed that very few of my acquaintances can appreciate this kind of fiction because more than an average intelligence is required to grasp the salient factors of science fiction. Of course this tickles my inferiority complex and is very gratifying to my vanity, but I fear that this kind of fiction may never be read by the masses.

It is a source of sadness to me, that there are so many people who cannot see the beauty in such stories. Perhaps a greater number really enjoy reading the more calm recitals of H. G. Wells, and even more yet, the rather immature stories of the great French writer, Jules Verne. I fear very much that the circulation of this high grade publication is sadly limited by the lack of readers of high grade intelligence. For this reason, we should all recommend this magazine to all of our more intelligent acquaintances, to the mutual benefit of ourselves and the publisher.

Byron W. Dunlavey,
Fresno, California.

The Medium of Achievement

It is man's imagination first, then his undaunted intrepedity that leads him into new fields of experimentation, exhaustive research, and, finally, the materialization of his dreams. Yet, this is not entirely "cause and effect." We might almost look upon imagination as Einstein looks upon effect *then* cause; that is: what we imagine of the future and *do in connection with it* is the *result of that future achievement*. Consider this: present scientific discoveries might well be called the *cause* of past imagination.

What is scientific imagination? What is science fiction? These two are one and the same. Without the power of imagination man could have no progressive civilization. There is no accomplishment in the annals of human history but that there was an idea behind it—an imagination. That is obvious.

There are undoubtedly countless people who read science fiction with twinkling eyes and a patient smile. And yet, if we are to consider the future by past imagination, it is unjust to shut our eyes against present probabilities. It is unjust, and, futile.

We cannot deny the inevitable forward march! Civilization does not stand still but presses forward, on and on. That is the law of universal progress.

The greatest encouragement to scientific advancement and the shortest way to accomplishment is not through irrational negation but by broad-minded receptivity. To shut the door in the face of new ideas is to only retard science in its inevitable forward march.

If there is a medium by which we can impart knowledge, extend intelligence, and hasten achievement, then that medium is the greatest power the world can offer us.

There is such a power!

Shall we turn a deaf ear to this medium?

I feel that there are a few million people, at least, who will reflect seriously on the pernicious injustice done to great men and great ideas of the past. What deaf ears and narrow minds listened to Copernicus, Newton, Galileo, Columbus! If, in the centuries past, there had been a medium to promulgate scientific literature and stimulate scientific interest there would have been a more ready acceptance of the ideas of our great men.

Surely, today, we see the fallacy of a closed mind! If we are to flatter ourselves with "the age of progress" we cannot scoff at endeavors to quicken this progress.

The requisites for conquering the *impossible* are few—imagination, the inevitable forward march, the medium.

This instrument, this medium, has come last but it is the greatest requisite of all—science fiction!

Louis H. Scher,
Perrysburg, N. Y.

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The Reader Speaks

IN this department we shall publish every month your opinions. After all, this is your magazine and it is edited for you. If we fall down on the choice of our stories, or if the editorial board slips up occasionally, it is up to you to voice your opinion. It makes no difference whether your letter is complimentary, critical, or whether it contains a good old-fashioned brick-bat.

All of your letters, as much as space will allow, will be published here for the benefit of all. Due to the large influx of mail, no communications to this department are answered individually unless 25c in stamps to cover time and postage is remitted.

Nothing Wrong With It

To Editor Science Wonder Stories:

Congratulations on your new magazine! The first issue was as good, if not better, than any one of your old science fiction magazines. All the stories were fine. The *Science News Department* went over big with me. The name was good, too, and the cover much more conservative. Also, I think it was a fine idea to show a picture of the author at the top of all the stories. On seein how fine your magazine is, I decided to subscribe also to *Science Wonder Quarterly* when it appears, and I want you to send me news of its publication.

I am looking forward to the July issue for your "Problems of Space Flying" and the other stories.

So you see, I find nothing wrong with your publication—except that it does not appear often enough. I cannot stop myself from finishing it the first day. I wish you would hurry with the *Quarterly* so that there will be more.

Heartily wishing you great success, I await next month's SCIENCE WONDER STORIES.

Jerome Levine
1060 51st St.
Brooklyn, N. Y.

(We don't know what to say to Mr. Levine's praises. We can only promise him better and better stories awaiting him. The QUARTERLY will be out about September 15 and it will contain some corking good stories. We are sure he will like the "Problems of Space Flying" that begins in this issue—Editor).

Some Frank Suggestions

To Editor Science Wonder Stories:

My copy of SCIENCE WONDER STORIES arrived yesterday. It could not have been much better.

The *Science News* will certainly be one of the best features in it. Your "Editorial" alone was worth the price of the magazine.

I will now give a little advice.

1. Keep on publishing the pictures of each author before the story. Also add a biography of each author, including his address, at least the address of the main writers.

2. End each serial at the end of six months. Six months are up in November. In December have all new stories, carry none over from November. The reason is I expect to have them bound. It is very inconvenient to have part of a story in another volume.

3. Leave out Stanton A. Coblentz. He may be good-looking but his stories are not good. Take a story published in a magazine that came out in April. Men with large bodies and small heads, with large heads and small bodies, with human faces and wolf heads.

They belong in a book of Mother Goose.

4. David H. Keller is interesting, but don't over do him.

5. James P. Marshall was very good, give us more.

6. What has become of George Allan England? What! left him in the cold. Bring him in and put him to work. I am sure your readers would like to have his "Darkness and Dawn." As you know, or at least you should, it comes in three parts:

1. Darkness and Dawn.
2. Beyond the Great Oblivion.
3. The After-Glow.

There is another one which I have never read called the "Golden Blight" and from reports I have found on it, it must be Science fiction. If you beg him, he may give you some more good books or short stories.

7. When possible make the paper thinner. It makes a bound book much better looking if it is not bulky.

8. When publishing stories by Jules Verne, use a better translation. I have a copy in book form of every story you have published by him. My translation in those books are at least 20% better. My mistake, I do not have the "Purchase of the North Pole." I have fifty-two by him altogether.

9. Give us some of Garrett P. Serviss.

10. Give us 100 pages to a magazine, not 96. When I pay 25c. for a magazine, I want four pages for a cent. I don't know where my Scotch came from, but I must have some.

Curtis Taylor
Utica, N. Y.

(Needless to say Mr. Taylor's frank and sincere criticisms of the maiden issue, are very much appreciated. No magazine, or any enterprise in fact, can prosper unless it properly serves those who support it. And it is only by frankness of this kind that we learn what our readers like. The suggestions of Mr. Taylor are being taken under consideration, and go to swell the tide of letters we are receiving from interested readers.—*Editor*).

AN OLD FRIEND

To the Editor:

I have been a constant reader of the *Electrical Experimenter* since Thomas A. Edison's picture appeared on the cover, November or December, 1919. I should like to see in your magazine a short biography of one noted scientist or inventor in each issue. I am very busy and like a story that takes you away from the cares of everyday life. Something with a patriotic ring to it.

Science fiction means to me·

A stimulus to forward thinking. New, and to me unknown facts. A new application of old laws. Sometimes the expanding of old theories in new ways. A pleasantly spent hour with a spice of human interest.

G. B. Young,
Mohawk, N. Y.

(We are glad to find a busy man such as Mr. Young finds solace in science fiction. He is numbered among the thousands who so read it for diversion and new stimulation.—*Editor.*)

Prefers Science Fiction to Boys

To the Editor:

I am real glad that I have a chance to get a special charter subscription rate on the new magazine.

I can never find time to read other magazines, *but* I can *always* find time to read my favorite which you put out. I don't know, but somehow the science fiction stories seem more real to human life than the others. They show the advancement of civilization and science throughout the ages, also giving hints of what might be in days to come.

I am only a high school girl in her senior year, but I don't go in for a lot of foolishness that a lot of girls do. I would much rather sit at home with a good book than go out with a dozen boys. Well, I'll close now, wishing the new magazine the best of luck.

Geraldine Compton,
Detroit, Michigan.

(This is quite an unusual letter from a young woman. We can agree with Miss Compton that the science fiction story is real because it gets into one and touches the vital chords, of feelings, beliefs, hopes and desires. It carries him to a new world of, it seems, his own making, one that is interwoven with his own dreams We hope that we shall continue to please you, Miss Compton.—*Editor*).

We Feel the Responsibility

To the Editor:

Good luck! I have more than a personal feeling when I say this. It is for the good of the community that it is kept aware of the "miracles" of science. I for one shall always be an ardent reader, no matter what the name is. Best wishes.

Bernard B. Melton,
2436 42nd Street,
Long Island City.

(We appreciate Mr. Melton's cheery words, from the bottom of our heart. What he expects from us, we shall certainly accomplish, knowing we have the support of readers such as he.—*Editor*).

Questions Making of Protoplasm

To Editor Science Wonder Stories:

As a former reader of yours, I believe I should tell you my opinion of your new magazine.

The stories are by authors whom I believe are well selected to write such stories for the magazine of "futurists." The stories themselves were well selected and the addition of the "news" department is excellent.

The title of the magazine is put on in a proper method, but why not put a futuristic design on the cover instead of an imaginative figure

Will you publish a quarterly, semi-annual, and an annual issue? If you do, why not raise the subscription price slightly and send it with the monthlies.

Now as to some of the stories:—

I saw a big headline in one of the city's leading papers—

Seige low in Berlin; Reds in new riot. Is the story, "The Reign of the Ray," going to be a true prophecy? According to the dates in the story the time is ripe for Socialistic rebellion and invasion.

Warriors of Space!—I wonder how the destroying ray that many authors have invented in many ways does not destroy the ground directly beneath, thus creating a yawning gap wherever the ray happened to strike.

There is no necessary comment needed for the other stories, except that in "The Marble Virgin," the author has very little knowledge of anatomy. The body is made up of certain different kinds of tissues so how could the machine make so many complicated pieces of muscle and tissue. The rays that Huxhold had discovered made things into living protoplasm and not into inorganic matter such as teeth! It is a wonderful story but not able to be backed by Science.

Alfred Greenky
1018 East 163 St
N. Y. C.

(Mr. Greenky's question about the making of living tissues in the "Marble Virgin" is a fair one. What Professor Huxhold discovered was that all materials, no matter how complicated, were the result of a definite arrangement of the protons and electrons that composed it. By changing the internal makeup of any substance the substance is changed. Living tissue is just one of those complicated arrangements of electrons, which differ no wise from the electrons of a piece of stone. It is merely the arrangement of the electrons that counts. So what he did was to change them, and thus creating living cells, he proceeded at once to combine that into a living being. It is undoubtedly uncanny but who can say that it is a thing which will never come to pass. A quarterly will be published about September 15.—*Editor*).

The Reader Speaks

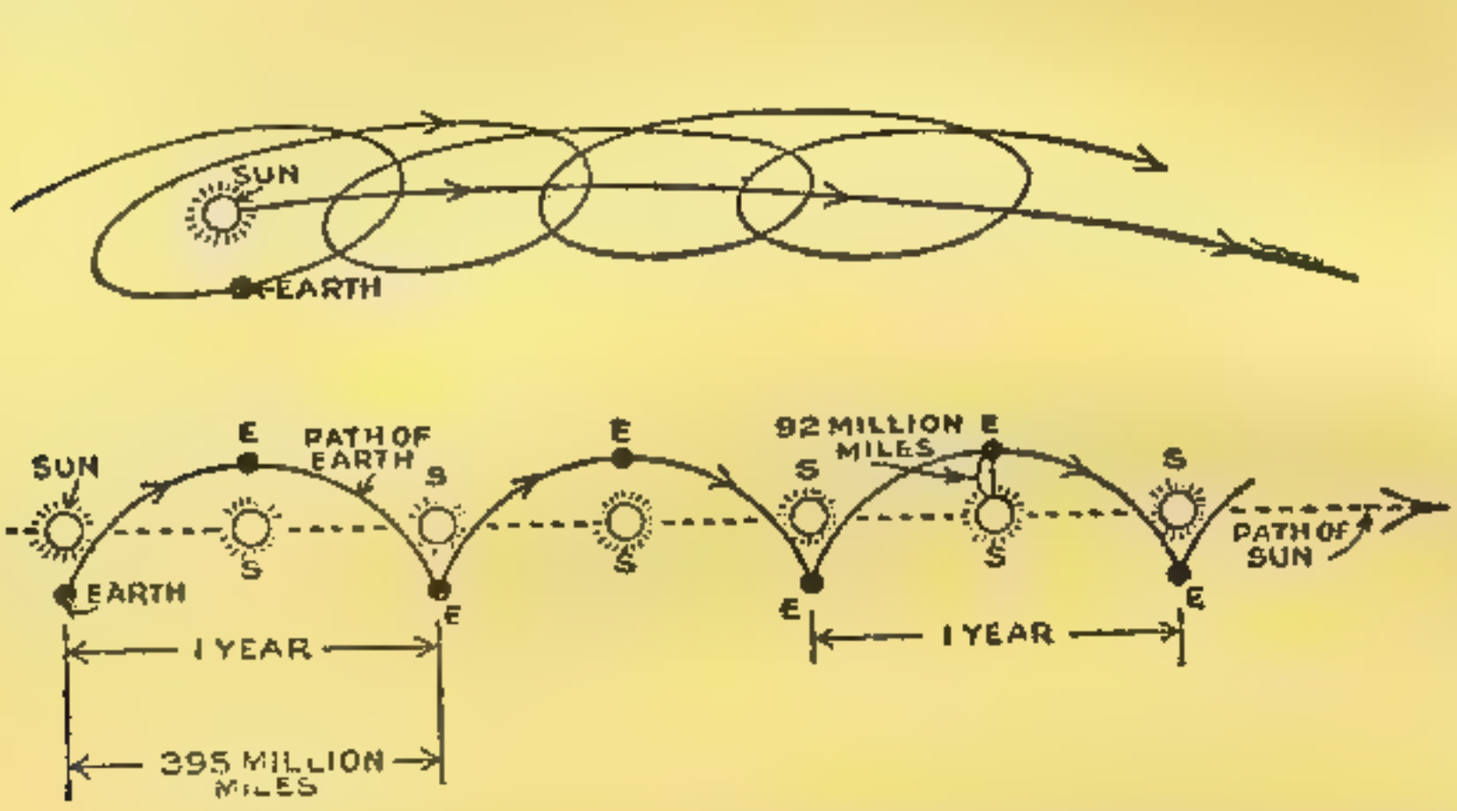
(Continued)

What Is the Earth's Real Movement?

To the Editor:

As I am writing, sending in my subscription, I may make a suggestion that you try, either in your first issues or later, to give us some good explanation as well as illustrate if possible, the whole planetary or solar system and its orbits, etc. There are many who do not grasp some of the stories and can't understand them unless they had high and scientific education as most of your writers have; however, such an elementary description and diagram would give the ordinary readers a better understanding of some of the cosmic workings of our universe. I and many others have been trying to check up on some of the descriptions in your past stories you edited, and I hardly can remember now, but it seems that the speed of the sun and planets seem to be not plain to me, at least in regards to our own world and the sun. To our common reasoning the earth ought to travel twice as fast as the sun to catch up with the sun's speed when it makes the orbit around the sun in one year, as the sun keeps on going all the time. Therefore the whole solar system travels in spirals around the sun, and the whole in spirals again around some other larger system, and a diagram of that would give us some idea and better grasp of the stories that deal with the cosmic system of the universe.

I don't remember just now, but it seems as if the speed of the sun and earth didn't check, according to the figures given in some of the stories. I hope you give this idea some consideration and possiby try to make a special corner in your magazine giving some true and correct explanations as to the workings of the planets, etc. I imagine the whole solar system moves in spirals—



Above—Mr Ulan's conception of the earth's movement. Below—The Editor's conception.

And as the sun keeps on going the earth stretches its orbit into an ellipse, but not at the same place in the void and if seen in its "whole" must describe a spiral as I indicated; also traveling twice as fast as the sun to catch up with it.

Please study this up a little and perhaps you can give us busy readers —something of that sort to explain many things which we ordinary readers either do not know or have forgotten, and wishing your new magazine and all those who will contribute to it the best of luck, I remain

J. A. Ulan,
San Diego, California.

(Mr. Ulan's point about the movement of the solar system is perhaps well taken, although he overlooks a few considerations. It is true that the sun moves through space, its speed being about 12½ miles per second or about 395,000,000 miles a year. In our *Science News* columns under Astronomy is a statement that the sun has moved a distance of 70 light years in the past million years. Now one would suppose that the orbit that the earth would describe about the sun would be an ellipse, *if the earth were merely a freely moving body.* But that is not the case. The earth is tied to the sun as much as a point on a rim of a wheel is tied to the hub. The spoke of the wheel in this case is the gravitation pull of the sun. So while the actual path of the earth through space is not a circle, it is in fact a *cycloid* (see illustration), its motion about the sun is a circle The analogy of the point on the rim of a wheel may be carried further. Imagine a moving wheel with the hub (the sun) moving along a road at the rate of 12½ miles a second. Then the motion described by a point on the rim will be that of the earth. The wheel in this case makes one revolution in 365 days, and the radius of the wheel is 92 million miles. The earth's speed through space is therefore two movements, a movement about the sun (rotation) and a movement "along the road" (transation). And as it is fixed to the sun at an equal distance, its translatory movement is the same—12½ miles a second. (In our illustration for simplicity we have indicated the motion of the sun as a straight line. According to Einstein there is no straight line motion—for all space is curved). The earth has of course its third movement about it own axis. (spinning) and a fourth movement—a wobbling about its axis. It is the third movement that causes night and day and the fourth that causes the seasons of the year —*Editor*)

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The book has been written essentially for those who wish to build television receivers and transmitters either for entertainment or research purposes.

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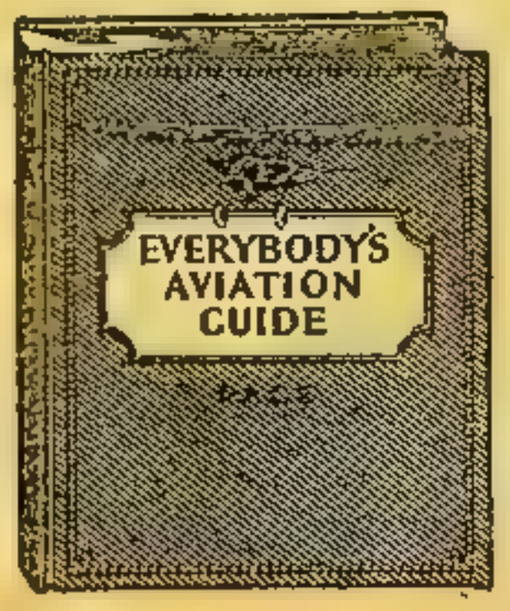

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The Reader Speaks

(Continued)

Questions Infinite Speed

To Editor Science Wonder Stories:

I just read the first issue of SCIENCE WONDER STORIES, and I'm glad to see Mr. Gernsback is back in the science fiction business.

I would like to suggest one thing—have one of your Physicists look over the "Science Questionnaire" before you let too many slips get by! In question two you ask what determines the speed of a body in space—and say there is no limit—or the author, referred to, does. The "Skylark of Space" got away with infinite speed by saying that he knew that a body really couldn't go as fast as light—but in order to get away from Earth, to get out of the solar system he claimed a higher speed, and said Einstein's mathematics were theory, and his speed was fact. For which bit of originality I admire him—but don't pass the infinite speed idea out free! It really isn't good—especially in the first issue! But to be serious, will you please tell me what your rates on stories are?

John W. Campbell, Jr.
Boston, Mass.

(In answer to Mr. Campbell's very justifiable question, we plead guilty to a fault in the numbering of the page in which the answer to the question he refers to it found. The question was: "What determines the speed of a moving body in the earth's atmosphere? In empty stellar space?" The answer is found in the first column of page 49 instead of on page 50. Donald says "The thing that limits speed, as we know it, is friction. Given a certain motive power a machine will accelerate until the friction of the moving parts just balance the force that propels it." That is the answer to the first question. Then he goes on to say "Beyond the atmosphere, in outer space, there is only a void, so there can be no friction. The only thing that can limit a car is its own inertia, its own weight." Naturally, Einstein's theory, which is finding general acceptance, would have a body, travelling at the speed of light, with a length reduced to zero in the direction of motion. We hope this point is cleared up.—*Editor*).

LIKES PURE FICTION

To the Editor:

I am enclosing a check for a two years' subscription. I would make it a longer time, but who knows how long he will live?

I want to congratulate you in your new enterprise. As the originator of the publication of a magazine of science fiction you have rendered a great service to modern literature and to future thinking and invention—and you do know how to edit such a magazine.

I have never written a criticism of any story, as there are plenty of others who may like the one I do not care for. All I say is to give us stories which will hold our interest; let the authors have full play of their imaginations; and I will not care whether their stories are possible, probable, scientifically correct, or otherwise. Some may read your magazines just in order to pick flaws and say to themselves, "What great scientists we are!" But I read such a magazine to have an evening or so of enjoyment, to reach out in my imagination and do things with the leading characters of the stories. I like to feel that much which the author expresses can possibly come true—and who knows what the future may bring?

Give us the impossible with the possible. Let the author be technically correct in things which are now known to science—but let us have imaginative tales which are not held down to the laws which are now known. In other words, let us have interesting fiction, not dry facts and figures! I am returning your questionnaire with suggestion for a name for the magazine, my choice of type of stories, etc.

I wish you great success in your venture, and shall look forward with interest to receiving the second issue of your magazine, which I hope will come out soon.

W. A. F.
Sharon, Pa.

(We have always believed in the necessity of imagination in our stories. And we believe that imagination plus science makes a combination unbeatable for fiction.—*Editor.*)

BOOK REVIEWS

PROBLEMS OF INSTINCT AND INTELLIGENCE, Major R. W. Hingston, 288 pages, illustrated, stiff cloth covers, size 5¼x8, published by The MacMillan Company, New York. Price, $3.25.

A scientific textbook, and a thrilling story of the despised bugs that we crush beneath our feet, is the present tone. It is written so simply that one without any scientific knowledge whatever could understand it fully; and yet it is a penetrating glimpse into the interesting problem: have lower forms of life such as insects, intelligence. Major Hingston's conclusion, at least for ants and wasps, is a decided yes. He questions the intelligence of other forms and for the spider and locust, he concludes that instinct is the sole guide to their life. The author first reviews the difference between instinct and intelligence and finds the former to be action without instruction, unassociated with reasoning and a real state of ignorance of what it is doing. He mentions the marvelous construction of the spider's web and the movement of locusts, in which they travel in a definite direction never turning aside. Once when a broad river confronted them they moved into the river and were drowned in swarms—unable to deviate from their instinctive path. Thus the instincts of these little things are sometimes wise, sometimes foolish—they are not always, as we imagine, the instinct of self-preservation. But ants and wasps do exhibit all those qualities of divergence from a path, choice of action, design and the knowledge of an end in view, which we associate with intelligence. They will help one another out of difficulties, form bridges of their bodies to help their compatriots across bad places, and in fact exhibit all the altruistic and jointly associated activities that we think of in connection with a finely conceived social order. In one experiment, a grasshopper was cut up in three parts, the second twice the size of the first, the third twice that of the second, and they were thrown to three parties of ants. In the first case 24 ants were despatched to bring in the morsel, in the second case 44, and in the third 89. They showed, in other words, a remarkable ability to judge the amount of work that must be done. We learn, also, that ants not only make slaves of other ants but that they keep cattle, some spiny insect that they stroke in order to make it excrete a liquid that they use as food. This book is highly recommended.

THE STRANGE CASE OF JOHN R. GRAHAM, by Victor Kutchin, 120 pages, stiff cloth covers, size 5¼x8, published by Dean and Company, New York, price, $2.00.

If one comes to this book expecting a terrible mystery, he leaves it disappointed. Although the author has dextrously involved the story, so that we have occasional narratives within narratives, the tale remains only a fairly well written biography of a man whose life was involved in difficulties. In short, it is the story of John Graham, whose mother had married another man and then married his father without being divorced. This proved a source of constant hatred to the father. The mother's brother, named Sorenson, quite a villain, who was the cause of the deceit is a foreman of the father's lumber mill and blackmails him continually. Young Graham visiting near the lumber mill falls in love with Sorenson's daughter, Annie. His father exacts a promise that John will never marry Annie. After many incidents John leaves and goes to Chicago to study medicine. Near the time for his graduation, he has a dream that he has killed Annie. Then, on graduation night, he agrees to make a dissection for the students and discovers that it's Annie's swollen body that has been chosen. She had followed him to Chicago, was unable to reach him and drowned herself. John is filled with remorse during the ensuing years, a remorse which is broken only by occasional glimpses of Annie through concentration on her image. He decided finally to rejoin her by concentrating on her image at the time she had drowned herself. He does this and is found dead. Kutchin has prefaced his story by a statement that this is an attempt to counteract Coueism and other spiritualistic creeds by exposing the basis of self-hypnotism (the ability of John, by concentration, to conjure up images, that he desires). If this is the task one must conclude that he has failed. He has merely demonstrated what is already known to us, that by the concentration of the will on the mind, the mind is caused to obey. The book however, is interesting, even though it hardly comes up to the claims of the author or the invitation of the title.

THE WITCHERY OF WASPS, by Edward G. Reinhard, 286 pages, illustrated, stiff cloth covers, size 5x7½, published by The Centyr Co., New York. Price, $2.50.

Mr. Reinhard has given a much neglected tribe of *Hexapods* some very effective publicity in his simply written but none the less interesting book. Here is the life of the wasps revealed in all its complexities. They are creatures of powerful, blind instincts which make up a routine chain of habits seldom modified in their fundamental characteristics. But these instincts comprise complicated systems, differing more or less with the various species, and Mr. Reinhard has described in detail their fascinating activities both among themselves and in relation to the rest of the insect world.

Their curious manner of capturing food for the unborn young, and the way that food is kept fresh for the future; their efficient methods of sheltering themselves and their eggs; the various insects which the different species prefer to prey upon, and how they are, themselves, often victims of other more powerful insects; their habits in peace and war, and their ways in parenthood and in love. Each species has its own individual coloring and characteristics, and the book is abundant with photographic illustrations.

The very word "wasp" usually suggests a vicious idea, but the author, after having spent many days in interested and intelligent study of their activities, has found them interesting creatures, when closely observed, and harmless when unindisturbed. The book is clearly and colorfully written, often piquantly, and there are no technicalities to prevent those without previous biological knowledge from understanding and enjoying it completely.

DISCOVERY OF THE EARTH, by George Parson, 225 pages, stiff cloth cover, size 5¼ x 8, published by Luce & Company, Boston.

This book is an attempt to explain what must be a thrilling subject to everyone—how our solar system came into existence. The author indicates that he has his own theories, and that they will be revolutionary. So, in order to prepare us, he reviews all the important "cosmogonies" of the past—the comet theory of Buffon, the Nebular Hypothesis of La Place, the theories of Kant and Kepler, and those of the minor scientists. But all of these our author finds not entirely consistent with the facts. The theories he divides into two classes—those that hold that our system evolved from forces acting within itself and those which believe that some outside force—some catastrophe in aeons gone by. In each of these theories is some inconsistency with all the facts—and, as the author says, in order to fully accept a theory there must be full consistency. His own theory contends that the origin of the four "major" planets—Neptune, Uranus, Saturn and Jupiter—was different from that of the four "minor" ones—Mercury, Mars, Venus and the Earth. The former he believes, from all the evidence came as a result of gases being torn away from the sun during the approach of another larger mass while the latter, much older than the others, are merely satellites, caused during the sun's cooling. The earth and moon he says are twins instead of major and minor planets—they should stand as equals in the solar system, both revolving about the sun. While Mr. Parson's theories sound probable, they strike one as being based on insufficient evidence. He brings forward what is consonant with his theory and disregards all else. But whaever one may conclude he will find, if he is willing to concentrate, an absorbing history of the attempts to penetrate what, for us, is shrouded in mystery.

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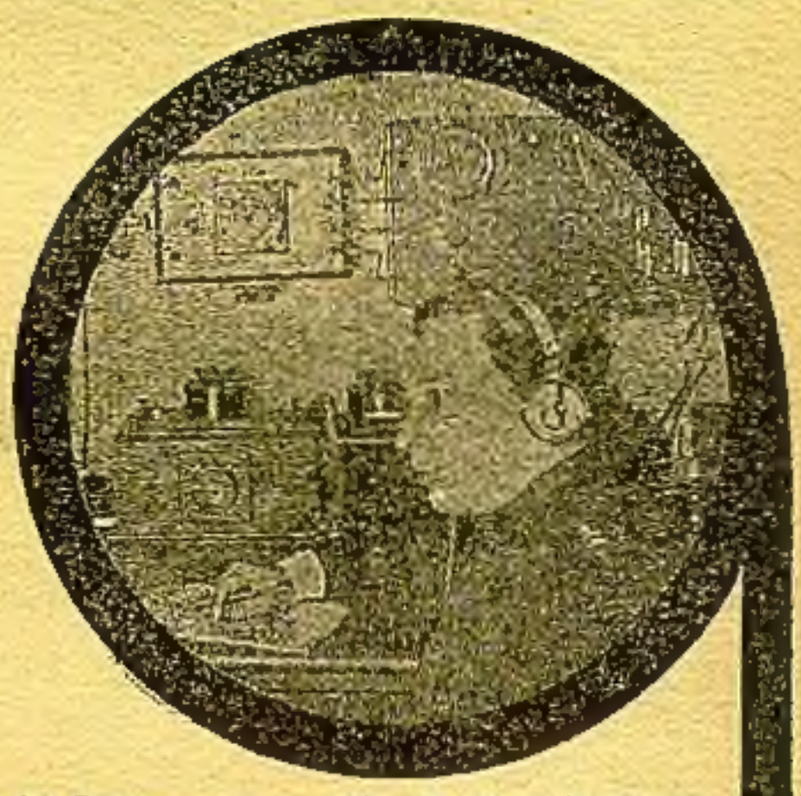

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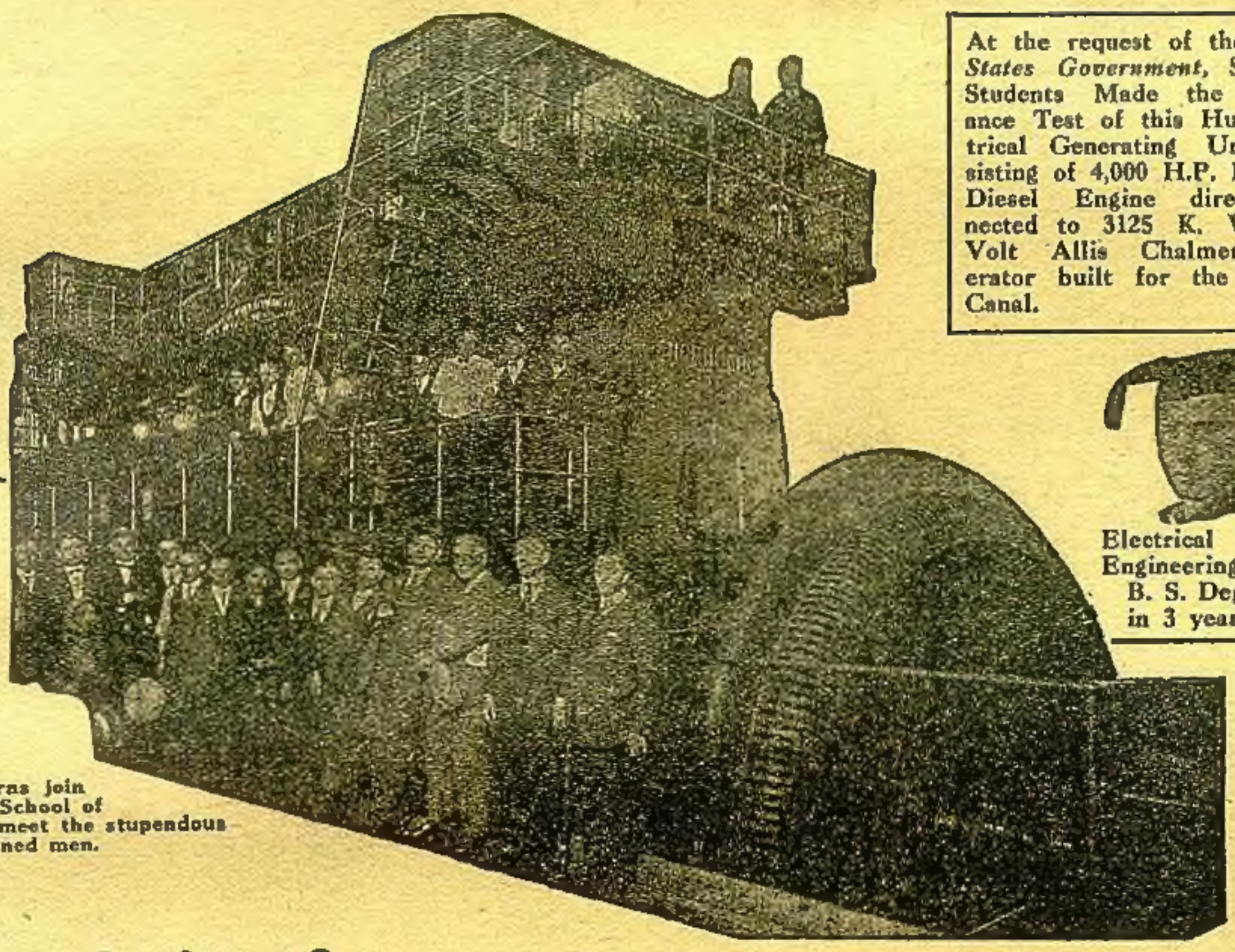

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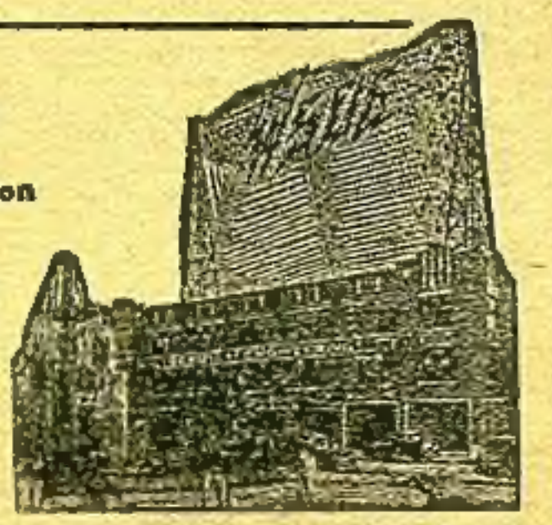

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